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**A STUDY OF BLACK OFFICER CANDIDATE
ATTRITION IN THE
UNITED STATES AIR FORCE**

THESIS

**Rodney D. Carroll,
Captain, USAF**

**Philbert A. Cole Jr.,
Captain, USAF**

AFIT/GSM/LAR/93S-4

Approved for public release

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**A STUDY OF BLACK OFFICER CANDIDATE
ATTRITION IN THE
UNITED STATES AIR FORCE**

THESIS

**Presented to the Faculty of the School of Systems and Logistics
of the Air Force Institute of Technology
Air University**

**In Partial Fulfillment of the Requirements for the Degrees of
Master of Science in Logistics Management
and
Master of Science in Systems Management**

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September 1993

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PREFACE

The purpose of this study is to determine how well measures of academic achievement and area of origin predict success or failure in the officer commissioning process, and whether the predictors affect black officer candidates differently than non-blacks.

Extensive statistical analysis was performed on these measures to determine their relevance in the Air Force officer commissioning process. The test results suggest that more work needs to be done in this area, in order to help the Air Force make its commissioning process more efficient. Efficiency in the Air Force is paramount, given ever shrinking defense budgets.

In conducting this study and writing this thesis, the authors have had a great deal of help from others. We are deeply indebted to our faculty advisors, Dr. Guy Shane and Dr. Kim Campbell, for their continuing patience and assistance in our times of need. We also would like to thank Major Denise Travers, Air Force Office of Accessions Policy; Mr. Harold Jensen, Department of Institutional Research, U.S. Air Force Academy; Captain Donell Smith, Minority Enrollment Office, U.S. Air Force Academy; Mr. Prosper Zuri, Headquarters, Air Force Reserve Officer Training Corps; and Dr. Jeff Schiel, American College Testing Program for providing us with valuable information for this study. Most importantly, we would like to thank

our wives, Delphine and Donna, for their patience and understanding on those many nights when we were tied to our desks with work.

Rodney D. Carroll

Philbert A. Cole Jr.

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ABSTRACT

This study investigated the correlation between measures of academic achievement and success in the Air Force commissioning process. The correlation between area of high school attendance and success was also examined. Any significant differences in the correlations for black officer candidates and other officer candidates were determined. An extensive literature review revealed that no similar study had ever been conducted. Discriminant function analysis was performed on a sample of approximately 14,600 U.S. Air Force Academy (USAFA) cadets and 6500 Air Force Reserve Officer Training Corps (AFROTC) cadets. The researchers found that measures of past academic success were only slightly correlated with success. The researchers also found that although area of high school attendance was slightly correlated with success for other USAFA candidates, there was no correlation for black candidates. The researchers concluded that using these factors alone to predict success would be inadequate. There are other non-quantitative factors that are crucial to predicting commissioning success. Furthermore, there are unique non-quantitative factors that are crucial to predicting success for black cadets. The authors stress the

need to continue this research. Potential areas of future research are suggested.

A STUDY OF BLACK OFFICER CANDIDATE ATTRITION IN THE UNITED STATES AIR FORCE

I. The Research Problem

Introduction

In 1976, the Department of Defense (DOD) concluded that institutional racial discrimination and discrimination against ethnic minorities had existed, and continued to exist, in all military branches (Northrup, 1979:5). One fact that contributed to this opinion was the low representation of blacks in the officer corps (a black officer is one who is considered a member of what is now commonly referred to as the African American ethnic group. A person is usually classified as black if either one of their parents are of African decent). Even today, no branch of service has equitable Black officer representation when compared to the minority percentage of the general population (Kostiuk, 1989:19).

The Air Force has attempted to make its officer corps more representative of the general population by increasing minority officer accessions. Officer accessions are the total number of candidates commissioned in a given year. Air Force policy sets minority accession targets to mirror the percentage of qualified and eligible minorities in the population. This percentage is also known as the "potential

pool" of minorities available. The current annual minority accession targets are set at eight to ten percent total, with six percent of the total being Black officers (Travers, 1992). In recent years the Air Force has met its targets for total annual accessions. However, recent black officer accessions have been consistently below targets. This fact has been a cause for concern among Air Force accession policy officials (Travers, 1992).

Background

Prior to 1973 the Air Force, as well as all other services, was under-represented in terms of minority officers. Between the years 1973 and 1983, the USAF took a more aggressive role in recruiting and commissioning minorities (Correll, 1972:25-29). There was a dramatic increase in minority commissioning rates with an accompanying increase in overall minority representation during this period (Sullivan, 1983:49-50).

The ten year period from 1983 to 1992 has produced a trend of decreasing black officer accessions. This is surprising given the fact that Air Force recruiting policy and accession targets have not changed. Accessions policy is still aimed at targeting the "potential pool" of qualified and eligible minority candidates. However, black officer accession percentages continue to gradually decline.

The two primary drivers of officer accessions are recruitment and attrition. Recruitment involves the adequate identification and contact of qualified and eligible potential officer candidates. Attrition, for the purposes of this research, is defined as the voluntary or involuntary reduction of officer candidates during the commissioning process. For various reasons, all officer candidates recruited do not complete training and are therefore not commissioned. While recruiting has received much attention, attrition is a prominent factor that has been nearly overlooked in the study of black officer procurement in the Air Force.

There are several documented sources that discuss the challenges faced by the Air Force in recruiting black officer candidates (Correll, 1972:25-29; Schweitz, 1974:13; Moore, 1978:15; Binkin and Eitelberg, 1982:152-153; Tindell, 1993:1). This experience has helped the Air Force continue to refine its recruiting policy. Given the current ten-year trend in black candidate attrition, one would expect to find a wealth of literature on this subject also.

During the past ten years, the average attrition rates for blacks enrolled in the Air Force Reserve Officer Training Corps (AFROTC) and the United States Air Force Academy (USAFA) have been notably higher than the attrition average for other officers (DPXOA, 1992). Despite this disparity in attrition rates, the authors found no published

material that examined the nature of black officer candidate attrition in the Air Force.

The recent decrease in black officer procurement, despite a consistently aggressive recruiting effort, suggests that attrition may now play a larger role in the commissioning process. This suggestion seems valid given the aforementioned ten-year differential in attrition rates between black and other officer candidates. For this reason, this study will examine the nature of black officer candidate attrition. With decreasing returns coming from recruiting, it now appears that other factors in the commissioning process (specifically attrition) must be addressed.

Problem Statement

If the steady decline in Black officer accessions continues, the Air Force will inevitably see a drop in overall minority officer representation. This ultimate result will occur because Air Force minority officers will continue to be lost, like all others, through retirement and normal attrition. Moreover, black officers have traditionally accounted for the majority of incoming minority officers. Without an equitable number of incoming officers to compensate for these losses, overall minority representation will begin to decline.

Understanding the nature of black candidate attrition is one key to enhancing the black officer accessions process. Attrition is a primary cause of decreased black officer accessions. Obviously if attrition was non-existent in the officer training process all candidates would be commissioned. However, recent trends show a marked difference between black and other officer candidate attrition (Other officers are those who are members of any ethnic group other than the black group. Other officers include Caucasians, American Indians, Hispanics, and Asians).

Researchers have suggested that individual factors, such as intentions, attitudes and education, tend to best predict attrition in military training environments and in university environments (The officer training environment is both military and educational). In addition, researchers have suggested that the reasons for black student attrition (i.e., not officer candidate) may differ from those of other groups (Fincher, 1964:293-305; McClung, Waddle, and Harris, 1968:56; Blalock, 1982:10).

These findings suggest a motivational process for blacks that is different from others. This may help to explain the differential attrition rate between black and other candidates. Thus, there may be a difference between predicting attrition for black and other officer candidates. Identifying the attrition predictors that are more prominent

for blacks will help to explain and possibly reduce the gap in attrition rates. The determination of these attrition predictors may also be helpful in the determination of recruiting strategy. The determination of any relative trends in attrition that are unique for black officer candidates can allow recruiters to shape their policy more effectively.

Losing black officer candidates during training dilutes the effect of recruiting. It is also inefficient and costly. In the last four years, the Air Force has spent over 40 million dollars on advertising (Tindell, 1993:7). A good deal of these funds were used to attract quality minority officer candidates. If attrition percentages during the commissioning process can be reduced, more black candidates who are recruited will become officers. Thus, funds would not be used to recruit and train candidates who will eventually leave the process.

Research Objectives

The purpose of this study is to determine how academic achievement and area of high school attendance predict success or failure in the officer commissioning process and whether the predictors effect blacks differently than other candidates. The factors examined are demographic in nature. Demographic factors or variables are those that pertain to vital population statistics such as, education, income,

marriage status, and residency. These factors include Scholastic Aptitude Test (SAT)/American College Testing Service (ACT) scores, Armed Forces Officer Qualifying Test (AFOQT) scores, high school grade point average (HSGPA), and area of origin.

Research Question

Are there fixed factors that contribute more to black officer candidate attrition than to other officer candidate attrition? For the purposes of this study, fixed factors are those factors that are used to judge potential success and are objective in nature.

Investigative Questions

The following investigative questions were developed to adequately answer the research question.

1. How predictive of success/failure are SAT/ACT scores and HSGPA for United States Air Force Academy (USAFA) officer candidates? Does this predictive capability vary significantly between blacks and other officer candidates?

2. How predictive of success/failure are SAT/ACT scores and AFOQT scores for Air Force Reserve Officer Training Corps (ROTC) officer candidates? Does this predictive capability vary significantly between blacks and other ROTC officer candidates?

3. How predictive of success/failure is area of high school attendance for USAFA officer candidates? Does this

predictive capability vary significantly between blacks and other USAFA officer candidates?

Hypotheses

The following hypotheses were tested, in relation to the investigative questions.

1. Ho : The predictive effect of academic variables does not vary significantly between blacks and other candidates.

2. Ho : The predictive effect of area of high school attendance does not vary significantly between blacks and other candidates.

Scope of Research

Since there has been a trend of decreased accession for black officers in the last 10 years, this research effort concentrated on attrition for black officer candidates. The study examined the 14,612 officer candidates who were enrolled at USAFA and a sample of 6,482 candidates enrolled in ROTC between the years 1983 to 1992.

Officer Training School was not examined since its commissioning process is significantly different from both ROTC and USAFA. Candidates are not selected for OTS until they have graduated from college. As a result, an adequate examination of the OTS commissioning process would examine the candidate's college performance in addition to high

school performance. This would represent a potentially significant confound.

The intention of this research was to determine the relationship, if any, between measures of academic success and attrition for officer candidates at USAFA and ROTC and whether there is a difference in this relationship between black candidates and other candidates.

Summary

In order to attain the best fighting force available, the Air Force has attempted to make its force structure representative of society as a whole. Thus, minority officer goals have been established. Recently, the targets for black officers have not been met. One reason for this is the high rate of attrition among black officer candidates.

This thesis will examine attrition factors (i.e., academic achievement and area of high school attendance). The intent is to determine the relationship, if any, that these factors have on officer candidate attrition and whether there is a difference in this relationship for blacks and others. Reduced attrition percentages will ultimately increase black officer accessions. This will help the Air Force reach its goal of increasing minority officer participation in the officer corps.

II. Literature Review

Introduction

When considering the current state of Black officer candidate attrition in the U.S. Air Force, two issues must be examined. The first issue is the history of Air Force minority officer accession policy. This will aid in understanding the importance of attrition in the officer procurement process. It will also show how recruitment has been the area of emphasis in the procurement of black officers, while little attention has been given to the effects of attrition.

The second issue to examine is turnover theory and its applications to officer candidates. This examination is necessary in order to understand what researchers have found to be the primary predictors of attrition. In addition, this examination will provide insight as to which of these predictors are relevant in determining the success of an officer candidate. Finally, the research will show how these predictors may effect black candidates differently than others.

The remaining portion of this literature review will be divided into two primary areas: history of minority officer accession policy and a review of turnover theory. The literature on accession policy

and turnover theory uses the terms attrition and turnover synonymously. Thus, these terms are used interchangeably throughout the literature review.

History of Minority Accession Policy

Overview. The subject of black officer candidate attrition deserves attention primarily because of its influence on black officer accessions. We must remember that the decrease in black officer accessions is the overall area of concern. However, attrition is one of the two primary drivers behind officer accessions. A review of accession policy history reveals that attrition is an area that has been ignored when studying black officer procurement strategy. Examining the evolution of minority officer procurement policy shows that most emphasis has been on recruitment of blacks.

The accession history will be divided into three time periods which show distinct trends in black officer procurement. Prior to 1973, black officer participation was so small that determining the effect of attrition was not important (Binkin and Eitelberg, 1982:1-38). This period saw initiatives that laid the foundation for minority officer accession policy. Between 1973 and 1983, attrition would become more of a factor in the commissioning process because of the

difficulty recruiting blacks (Bates, 1973:54-63). However, attrition still played a secondary role to recruiting. As we entered the mid-1980s and 90s, intense recruiting began to decrease in effectiveness, while black candidate attrition rates began to exceed those of other candidates.

Early History/Trends (Prior To 1973). Black Americans have taken part in all of their country's wars despite the fact that the government and the military maintained an exclusion policy. Unfortunately, Black soldiers have not always received the appropriate recognition for their efforts. The period from the start of the Civil War through the end of World War I saw increasing participation by blacks in the armed forces. However, practically all black participation was in the enlisted ranks.

In 1863, after the enactment of the Emancipation Proclamation, the Union forces began to recruit blacks to serve in the enlisted ranks. These units were segregated and led by white officers. Although there were no black commissioned officers during this period, one notable trend emerged. Blacks served as coastal, river, and harbor pilots. This marked the first time blacks were officially regarded as professionals by the military (Sullivan and Miller, 1983:15). World War I marked the first use of blacks as commissioned

officers. However, their use was extremely limited and no blacks served in offensive roles during combat. Almost all were assigned as military chaplains. This policy remained intact until the period just prior to World War II (Binkin and Eitelberg, 1982:45).

Although Black soldiers performed extremely well in the first World War, Army leaders took decisive measures to maintain their policy of segregation in the military. A key element to maintaining this policy was an Army War College study conducted in 1925. The stated purpose of the study was to evaluate the performance of the Black soldier in World War I (Osur, 1977:5).

The Army War College (AWC) study relied on the results of intelligence tests administered during the war. The intent of these tests was (1) to classify men according to their mental ability; (2) to segregate the mentally incompetent; and (3) to assist in the selection of qualified men for responsible positions. The grading standards of these tests were rigid and no adjustment was made for factors that could effect the scores, such as educational background, environmental effects, or economic influences. Although the AWC study did include some data demonstrating that blacks from the North performed better than Whites from the South, this fact was not taken into consideration.

The study reported that for the average individual "the cranial cavity of the Negro is smaller than the white; his brain weighing 35 ounces contrasted with 45 for the white" (Osur, 1977:5). Furthermore, blacks who did perform well on the tests were explained as having a "heavy strain of white blood" (Osur, 1977:5).

Racially biased, intellectually acceptable findings such as those presented by the Army War College provided ammunition for continued discrimination of blacks in the military. This pattern would continue until the period just prior to World War II, when changes began to occur.

The period from 1940 to 1973 saw initiatives that laid the foundation for current minority accession policies. The first major push toward equal representation came in 1940. During the 1940 election year President Roosevelt announced that the War Department would change its policy in three ways. First, it would actively work toward making the percentage of blacks in the Army mirror the general population. Second, it would allow blacks to serve in all Army units, including combat forces. Finally, it would admit blacks into officer candidate school and they would later serve as pilots in Black aviation units (Binkin and Eitelberg, 1982:19). Though all three initiatives were prominent, the third had the

largest impact in terms of future Air Force minority officer accession policy. Although the Air Force did not exist in 1940, its predecessor, the Army Air Corps, fell under this new policy. Thus, by the time the Air Force was made a separate service in 1947, initial minority officer policy was already in place.

The next major event that shaped accession policy occurred in 1942 with the initiation of the selective service. Through mandatory participation, the draft would be used to shape military force structure from 1942 through 1973. There were two other significant initiatives prior to 1973 that helped shape the officer corps composition. In 1948 Executive Order 9981 was implemented, which required equal opportunity treatment in all services. Finally, in 1954 all segregated military units were either abolished or integrated (Sullivan and Miller, 1983:19). These early initiatives in equal opportunity had mixed results. On the positive side, black officer participation increased from 0.6 percent in 1942 to approximately 2 percent by 1973. However, blacks were still vastly under-represented in relation to both the general population and the percentage of blacks graduating from universities (Binkin and Eitelberg, 1982:60).

In summary, the emphasis in the early years of black officer accession policy was primarily on simply

attaining a place for blacks in the officer corps. Thus, officer candidate attrition was not a significant policy factor. The period saw initiatives implemented which helped blacks go from an all enlisted force to being part of the officer ranks. Most military personnel came by way of the draft. Thus, recruiting played a very minor role in the black officer procurement policy. However, recruitment still received more attention than attrition in the black officer procurement process. This trend would continue and become more important in the period following 1973.

History/Trends (1973-1983). An overview of the ten year period from 1973 to 1983 shows that the Air Force sought to increase black officer accessions, despite difficulties in recruiting. In 1973 the all volunteer force (AVF) was initiated. This meant that the Air Force could no longer use the draft to help shape its force structure. As a result, recruiting became the primary means to attract potential officer candidates. In addition, the competition for quality black graduates in the marketplace had increased (Bates, 1973:54-63). The Air Force met the challenge by using a more aggressive recruiting strategy (Correll, 1972:25-29). This strategy was also affected by the emergence of equal opportunity initiatives.

During this time period the government saw the rise of affirmative action/equal opportunity directives. These ideas eventually made their way into Department of Defense (DOD) policy in general and Air Force officer accession policy in particular. The Air Force recruiting strategy was very successful. Thus, even though recruiting had become more difficult, it was still the most emphasized aspect of black officer accession policy while candidate attrition continued to be ignored. The following discussion shows this trend in detail.

By 1973, there was increasing evidence that suggested that attaining black officer candidates was becoming increasingly more difficult. In his article "Problems Recruiting blacks for the Service Academies: A Perspective," Lieutenant Commander Robert G. Bates noted the most prominent recruiting problems. These problems, incidentally, were also applicable to ROTC recruiting efforts.

Bates noted that the potential pool of black officer candidates was diminishing. Several of the prominent reasons were: increasing competition from the civilian sector, competition between services, and an overall lack of esteem for the military by black youths. Of particular note to Bates was the last point, which revealed the attitude of young blacks with

regard to the military. Bates found that in a 1971 poll of black students, when asked what person they would most like to be, only 2.7 percent replied military figures (Bates, 1972:54-63). Bates' findings were true for all military branches and would become a cause of concern for DOD officials.

By the mid 1970's, the number of black candidates in the service academies and ROTC was disproportionately small. Noting that there were not nearly enough junior black officers in the pipeline, Deputy Assistant Secretary of Defense for Equal Opportunity, Lt. Col H. Milton Francis (Ret.) personally launched a campaign to visit universities with large black populations (Schweitz, 1974:13). Francis was concerned with the attitude of black youths with regard to the military. He urged young blacks to consider the opportunities present in the military.

The problems with competition and attitude would continue to provide a great challenge to Air Force black officer procurement. This was especially true in light of the changes that would soon permeate Air Force black officer procurement policy. Due to the small cadre of black officers and emerging equal opportunity initiatives, the Air Force would soon launch an accelerated black officer procurement strategy (Correll, 1972:25-29).

By 1972 the Air Force had begun to set in motion a new strategy which attempted to bring equal opportunity to blacks and other minorities in every facet of Air Force life (Correll, 1972:25-29). The Air Force would implement two specific standards to reinforce equal opportunity: representation and equal selection. The representation standard had a large impact upon black officer accession policy. Under this standard the Air Force decided that minorities should be an accurate reflection of the pertinent demographics of the US population from which it was drawn (Correll, 1972:25-29). This marked the beginning of the "potential pool" concept of minority officer participation (Williams, 1992). This would mean a major increase in the minority officer cadre.

The Air Force plan called for an increase of roughly 3.5 percent in minority officer participation by 1980. Blacks would represent approximately 3 percent of this overall increase. To meet this goal, the Air Force launched into an accelerated officer procurement schedule. This schedule called for yearly increases in black officer accession, which would peak at a planned level of approximately 10 percent by 1980 (Correll, 1972:25-29).

To help bolster the effort, the US Air Force Academy (USAF) and Reserve Officer Training Corps

(ROTC) sought recruiting initiatives that would attract black officer candidates without sacrificing quality. Early proposals included such ideas as cash bonuses and increased use of civilian college preparatory schools (Schweitz, 1974:13). Although these proposals were not acted upon, other initiatives were.

The Air Force would first add minority recruiting specialist to the staffs of the Academy and ROTC. These specialists would target qualified black civilians and encourage them to join an officer training program. They would also target qualified black enlisted members for enrollment in the USAFA preparatory school (Bates, 1973:54-63).

Next, the Air Force would implement the "Enhancement Program" to better recruit black candidates (Moore, 1978:15). Under the "Enhancement Program," which was implemented in 1977, the Air Force obtained a listing of qualified black candidates from testing services. A board met to select potential candidates from the listings. These candidates were contacted and encouraged to apply for the Air Force College Scholarship Program (CSP). Those who applied would then meet the normal CSP selection board. This program was later discontinued because Air Force officials believed that the use of dual boards, which gave special consideration to black candidates, was

possibly in violation of the U.S. supreme court decision in the *Bakke vs. The University of California* (1978) case (Moore, 1978:15). Nevertheless, initiatives such as these gave the Air Force experience in recruiting black candidates. This experience would prove vital in the success of the accelerated procurement program.

Given the previously mentioned recruiting difficulties, the Air Forces' procurement strategy was ambitious from the start. However, with an increased emphasis on recruiting, the plan proved successful. The Air Force became second only to the Army in terms of the minority percentage of its officer corps (Sullivan, 1983:7). Minority officer accessions for the period 1973 to 1983 met or exceeded the targets set (Travers, 1992). The result was a near three-fold increase in the overall minority officer force (see Figure 1). Black officers represented approximately 60 percent of this increase.

The ten-year period, 1973 to 1983, was the most productive period to date for black officer procurement. This occurred in spite of increasing difficulties in recruiting blacks. The Air Forces' solution to this dilemma was to overcome recruiting roadblocks by attempting to refine its recruiting skills. Because this strategy was effective, little

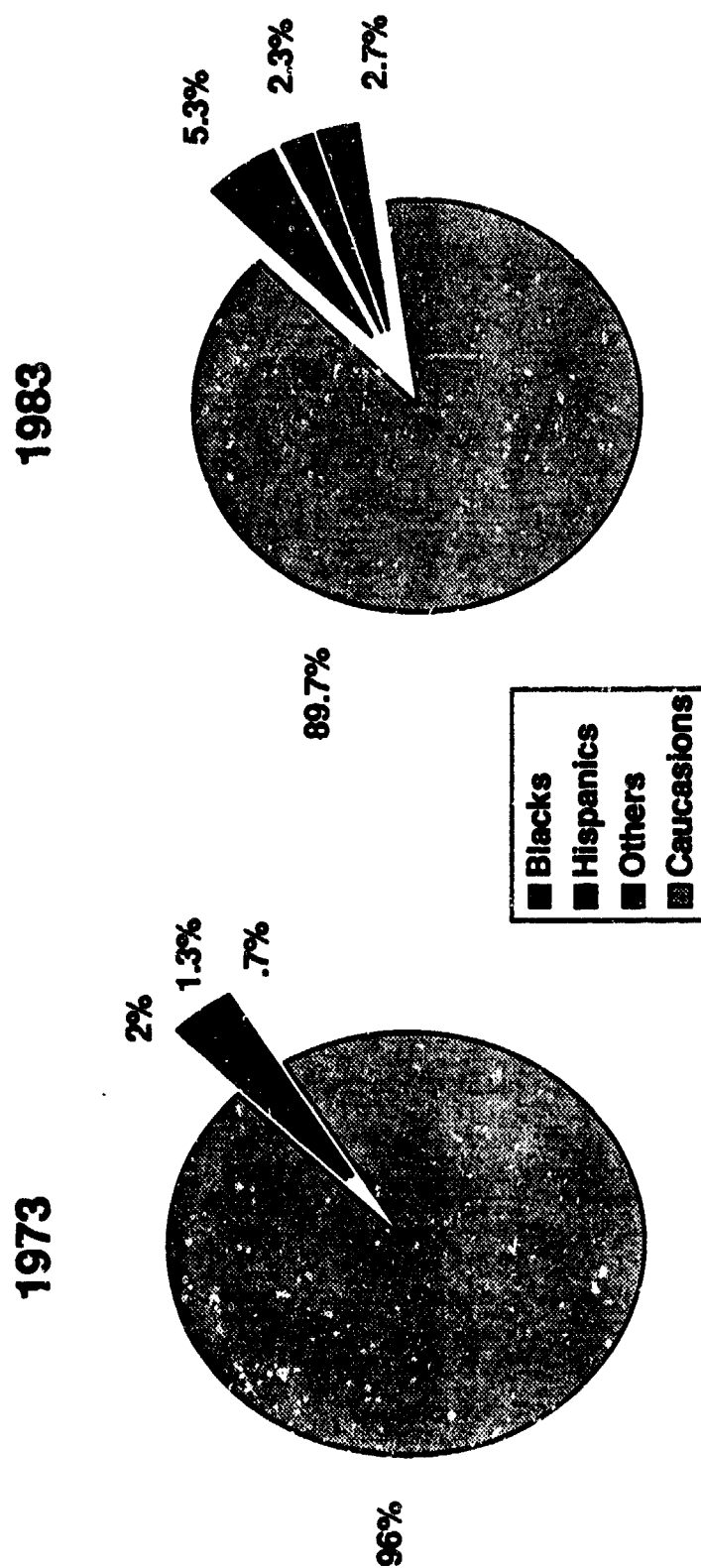


Figure 1
Change in Air Force Minority Officer Representation
 (Adapted from Sullivan, 1983)

attention was given to the number of black candidates lost during training (i.e., attrition). However, as the Air Force entered the mid-eighties, the effects of attrition became more visible (DPXOA, 1993).

History/Trends (1983-1992). By 1983 the Air Forces' recruiting efforts began to reap decreasing returns in terms of black officer accessions. With the decrease in new inputs (i.e., accessions), the black officer cadre has continued to fluctuate between 4.5 and 5.5 percent of the total officer force in the last ten years (Travers, 1992). This is approximately one percentage point below the Air Forces' black officer target (Travers, 1992).

This has continued despite a determined effort by Air Force personnel to attract all candidates from the "potential pool" of qualified and eligible blacks. While recruiting efforts continue, there has been little done in the way of understanding black officer candidate attrition. This despite the fact that black attrition during this ten year period was notably higher than other officer candidates, especially in ROTC (DPXOA, 1993).

Black officer accessions have decreased markedly during the current ten year period (see Figure 2). Though the Air Force Academy has maintained a consistent rate of procurement, the same cannot be said

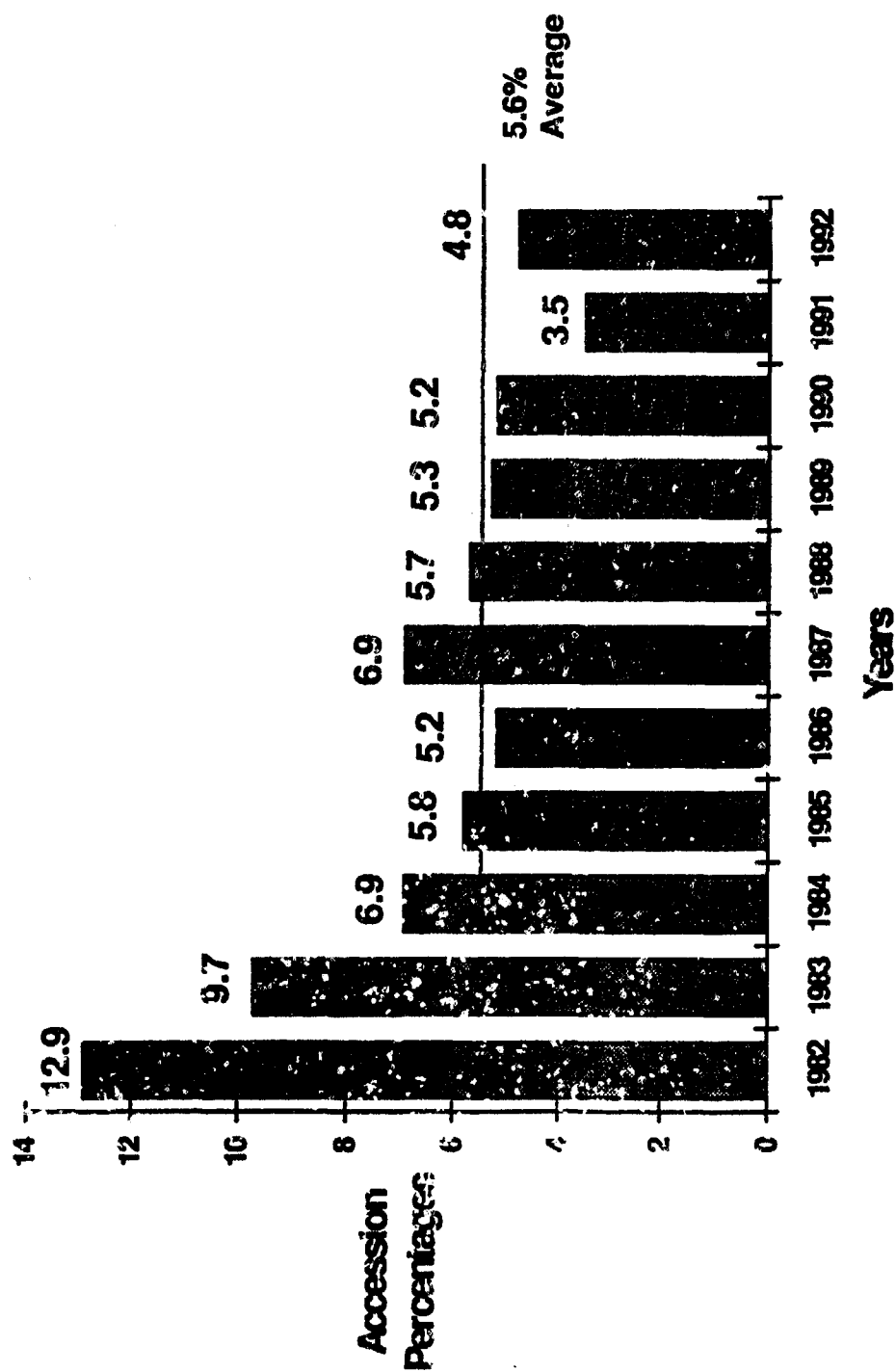


Figure 2
Black Officer Accession Percentages
 (Adapted from DPXOA Data, 1993)

for ROTC. By 1982 (the high water mark of the accelerated black officer procurement strategy) ROTC had attained a 12.9 percent black officer accession rate. In 1983 the decline began, as the black officer accession percentage dipped to 9.7 percent. Then, during the period between 1984 and 1992, the average ROTC accession rate dropped to approximately 5.6 percent, less than half of the 1982 rate.

Given the fact that AFROTC produced approximately 75 percent of the commissioned officers during this period (DPXOA, 1993), the reduced accession rate has had a notable impact. While a portion of this reduction can be attributed to a decrease in overall black officer candidate recruiting, attrition has continued to plague the black officer candidate training process.

Black officer candidate recruiting rates have decreased in the current ten year period, but this does not completely account for the overall reduction in black officer procurement. Given the competition for black graduates, coupled with reduced budgets for recruiting (Tindell, 1993:10), it was quite ambitious to assume that recruiting rates like those observed during the 1973-1983 period could continue. Because recruiting rates have slowed, the average percentage of incoming black officer candidates has decreased since

1983. Therefore, one would expect a lower procurement rate simply because fewer black candidates were in the officer training pipeline. However, the Air Force has managed to meet its minimum goal of recruiting an adequate percentage of the qualified and eligible black candidates in the population.

Air Force accession policy is still aimed at targeting and attracting this "potential pool". Black candidates have comprised 6 to 7 percent of the incoming USAFA and AFROTC classes during the current ten-year period (1983-1992) (DPXOA, 1993). This percentage has been approximately equal to the "potential pool" of black candidates. Maintaining this level of recruiting has required extensive effort.

During this ten-year period the Air Force has attempted to continually refine its recruiting strategy. To this end, the Air Force has recently instituted a Minority Officer Accession Working Group (MOAWG) (Tindell, 1993:1). This group consists primarily of minority representatives from all commissioning sources, as well as personnel from the Air Force Manpower Personnel Center (AFMPC). As the latest minutes of the MOAWG states, "The purpose of this group is to develop, review, and modify minority officer recruiting strategy and to unite all accession sources in the quest to increase minority officer

representation in the Air Force" (Tindell, 1993:1). Dedicated efforts from groups like this, coupled with other previously mentioned recruiting strategies, have proven successful. The MOAWG would like to see the percentage of black membership in new classes increase, as would the Air Force. However, by attracting the minimum targeted number of black candidates, the Air Force recruiting effort is at least adequate. This is not the case when examining black officer attrition rates.

While black candidate recruiting percentages have been stable, black candidate attrition rates have continued to rise. Thus, blacks are entering the officer training process at an equitable rate, but departing much faster than other candidates. In light of this current trend, the decrease in black officer procurement seems more closely related to attrition than recruiting.

During the current ten year period, the average black candidate attrition rate has been higher than the overall average attrition rate of other officer candidates. This has been true for both commissioning sources (see Figure 3). The problem is most acute in AFROTC. Black officer candidate attrition at the Air Force Academy has been approximately 4 percent above the overall academy average. However, in AFROTC, the

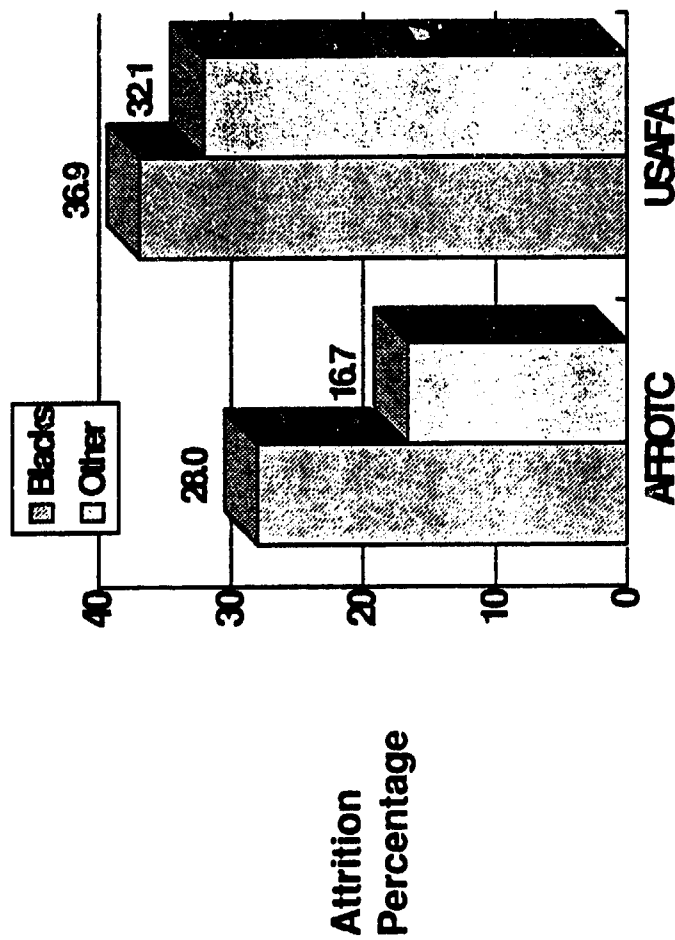


Figure 3
Average Black/Other Officer Candidate Attrition Percentages
(1983-1992)
(Adapted from DPXOA Data, 1993)

black officer candidate attrition has been roughly 10 percent higher than the overall ROTC average. As stated earlier, AFROTC commissions the lion's share of new Air Force officers. Thus, any problems in AFROTC will have a marked effect on black officer accessions.

In conclusion, it is becoming obvious that attrition is now playing a major role in black officer procurement process. The current ten-year period has seen a reduction in black officer procurement. This trend has emerged despite continued efforts to recruit qualified black candidates. Recruiting black candidates has become more difficult in recent years. However, recruiting efforts have produced an adequate number of incoming black candidates. Unfortunately, a good portion of these candidates do not survive the entire commissioning process. In addition, this portion of black candidates represents an attrition percentage that is notably higher than other officer candidates.

Persistent recruiting of black candidates cannot be overemphasized. However, the current trends suggest that recruiting efforts are possibly approaching maximum effectiveness. Thus, using recruiting alone to drive up accession rates may not work in the future. More attention should be devoted to understanding other factors which influence the black officer procurement

process, particularly black candidate attrition. The literature on turnover theory gives several suggestions as to why this attrition occurs.

Turnover Theory

Overview. There have been many studies conducted on the subject of turnover. These studies have primarily focused on understanding the relationship between turnover and various predictors. Researchers have studied various organizations, attempting to uncover which variables may cause attrition in a given setting. These organizations have included military training units (Landau and Farkas, 1978:1; Mobley, Hand, and Baker, 1979:10-18) and universities (Sue and Abe, 1988:1), the two environments most representative of the Air Force officer training. In addition, researchers have studied what variables are predictive of success for blacks (McClung, Waddle, and Harris, 1988:54-56). The findings from all such studies are useful in understanding the nature of black officer candidate attrition.

This section presents the significant findings from: (1) general turnover studies; (2) military turnover studies; (3) university turnover studies; and (4) black turnover studies. When studied together, these research efforts show a trend which suggests that

black candidates have much in common with other officer candidates in terms of prediction. However, certain predictors may have a greater impact on black candidate success than on other candidates, and vice-versa. In addition, there may be certain predictors that are unique to black candidates.

General Research on Turnover. Several reviews of research on civilian personnel have been conducted (Brayfield and Crocket, 1955:396; Porter and Steers, 1973:151; and Mobley, Griffeth, Hand, and Meglino 1977:1). An overview of this research reveals that attrition predictors reside in one of two categories: individual factors and organizational factors. Although these factors were usually studied in conjunction with voluntary attrition, the results have implications for involuntary attrition as well.

The research of individual factors suggests four primary categories: (1) motivations (e.g., a person's intent to stay or leave); (2) expectations (e.g., what a person expects from the organization); (3) demographics (e.g., age, education, and home of origin); and (4) personality traits (e.g., attitude). Note that these individual factors will continue to surface as the primary predictors of success in the following discussions concerning military trainees, university students (in general), and black students

(in particular). Note also that, of all the individual factors, researchers have consistently found a relationship between the factors used in this thesis (e.g., demographic factors) and attrition (Landau and Farkas; 1978:33).

Military Turnover Studies. Research has consistently shown that individual factors are most predictive of success in a military training environment. The three individual factors most often cited in the literature are motivation, education level, and marital status. Because AFROTC and USAFA are military training environments, these three individual factors should affect attrition in the commissioning process. However, the following discussion shows that education level seems most applicable to officer candidate success.

The prominence of individual factors was noted early and often in the study of military units. Landau and Farkas conducted a DOD study in the mid 1970s on Navy enlisted personnel in basic training. The purpose of this study was to "investigate the combined, interactive effects and relative contributions of both individual and organizational variables as they impact upon attrition/retention" (Landau and Farkas, 1978:3). The results of this study suggested that individual factors were stronger predictors of attrition than

organizational factors at that early point in the enlistment process (Landau and Farkas, 1978:33). The same finding was noted by Mobley, Hand, and Baker in a study of Marine Corps recruit training (Mobley, et al, 1979:10).

The results of these military training studies also suggest which individual factors are most predictive of success. In the Marine Corps study Mobley, et al analyzed information on demographic characteristics, expectancy, and intentions. The demographic information displayed a significant difference in education, AFOQT score, and marital status between dropouts and graduates. Specifically, this study found that graduates had significantly higher education, AFOQT scores, and were more likely to be single (Mobley, et al, 1979:10-18). Landau and Farkas, in their study of the naval enlisted training process, produced identical findings (Landau and Farkas, 1978:33).

Like the enlisted training environment, success in the officer training environment is linked to individual factors. In this environment, a cadet's motivations are highly predictive of his success/failure, and educational background proves to be an important measure of motivation (Butler, Lardent, and Miner, 1983:496-506).

These findings are corroborated in a 1983 study of the U.S. Military Academy and the Officer Candidate School (Army). The purpose of the study was to test the hypothesis that cadets are less likely to leave training when their motives are consistent with the demands of the organization (i.e., the Army). Focusing on voluntary attrition, this study excluded anyone who was forced to withdraw. The results of the study showed that a fit between individual and organizational motives plays a significant role in a cadet's success or failure (Butler, Lardent, and Miner, 1983:496-506).

There was one other finding which surfaced during this officer cadet study that is significant to the study of the Air Force officer training process. The researchers found that Officer Candidate School (OCS) cadets had much lower attrition rates than their counterparts in the Academy. In addition, the OCS cadets (who had already obtained college degrees) were a more homogeneous group in terms of motivation. Because of their enhanced academic background, the OCS cadets appeared to be a more stable, confident, and motivated group.

While the findings listed above effect the entire population of officer candidates, there are also findings specific to black candidates. One such finding was made by Major James G. Powell (USAF) in a

study of Air Force Undergraduate Pilot Training (UPT). The 1984 study attempted to determine factors which influence attrition rates for Black officers in UPT. Powell's findings emphasized the importance of education for black officers. Major Powell found that academics was one of the variables that determined success for the Black officer in UPT. In the words of Major Powell: "This is evidenced by the reality that both blacks and whites with technical backgrounds tend to experience a higher success rate than those with non-technical orientations" (Powell, 1984:33).

We see in these military studies a common element. Individual factors are most influential in success. Of the three individual factors stated, education would seem most applicable to officer candidates. Marital status seems to play more of a role in studies concerning either enlisted personnel or older officer candidates (e.g., OTS candidates). This factor does not seem to effect young officer candidates (i.e , the majority of ROTC students) as much. Moreover, USAFA cadets cannot wed during their time at the academy. Thus, martial status seems insignificant. In contrast, education is cited in every study and appears to influence individuals at all levels of military training. In addition, educational background was shown to be an important measure of a candidate's

motivation. Given that officer training is a combination of a military and university setting, educational background should consistently prove important to success. This will become even more apparent as we discuss the university turnover studies.

University Turnover Studies. As with military studies, university turnover studies show that individual factors are most predictive of success. Also, paralleling the military studies, the research shows that educational background is the most predictive individual factor. This should come as no surprise to anyone given the fact that education is the business of a university. What is specific to the university studies, however, is the identification of standardized test scores and high school grade point average (HSGPA) as the most potent combination of educational predictors.

Researchers, when studying academic factors, have continually sought the best predictor of success. Although there is some variation in the exact findings among the studies, the overall conclusions are the same: for most groups, high school grade point average is the best single predictor of academic success (Fincher, 1964:293-305; Larson and Scontrino, 1976:439-443; Aleamoni and Oboler, 1978:393-399; Sue and Abe, 1988:6). The one exception is black male students,

whose success is often predicted more accurately by standardized test scores (Funches, 1965:52-54; Munday, 1965:157-160; Thomas and Stanley, 1969:203-215).

While standardized test scores lack the predictive power of high school GPA (except for black males), they have been shown to increase overall predictive capability significantly when combined with HSGPA (Larson and Scontrino, 1976:439-443; Sue and Abe, 1988:6). Fincher suggests that the correlation between college GPA and standardized test scores is not significant enough to warrant the use of SAT/ACT alone in prediction (Fincher, 1964:293-305). However, he did find that standardized test scores have a significant supplemental value.

Fincher's thirteen-year analysis of SAT scores shows that supplementing high school HSGPA with SAT scores can increase predictive ability by an average of 45 percent. In a multiple regression, the combination of SAT and high school HSGPA yielded an average r -squared value of .706 (Fincher, 1964:293-305), using first year college HSGPA as the dependent variable. Although there were mild deviations in correlation between different ethnic groups, Fincher's results were approximately the same for all. It is also important to note that regression equations using HSGPA and standardized test scores as independent variables have

proven to be extremely accurate when used to predict student success (Larson and Scontrino, 1976:439-443).

Finally, research shows that either SAT or ACT can be used as a standardized test measure. Aleamoni and Oboler found that scores for both tests are capable predictors and there is no significant difference in their predictive capability (Aleamoni and Oboler, 1978:393-399).

Thus, we see that in a university setting high school GPA and SAT/ACT scores can be used to predict success with confidence. Again, this is intuitively pleasing given the fact that they are the primary criterion for university acceptance. However, there is one point worth noting. While SAT/ACT and high school GPA are good predictors for both blacks and others, the relative importance of the predictors seems different between the groups (at least for males). This is the first evidence suggesting that certain predictors may affect black officer candidates differently than other candidates. The research on black student attrition in the following section will continue to demonstrate this trend.

Studies of Black Student Turnover. The studies of black student attrition suggest that standardized scores are often the most predictive measure of undergraduate success for black male students. Males

represent almost all of the black officer candidate population. Thus, there may be a difference in predicting success between blacks and other candidates when academic predictors are used as the criterion. In addition, there is evidence that suggests that other individual factors may also affect blacks more significantly than other officer candidates.

Researchers began to suggest differences in predicting black student success as early as 1964 (Fishman, 1964:129-145; Clark and Plotkin, 1964:1). Both Fishman and Clark and Plotkin question the unconditional use of standardized academic measures as predictors of black student success. Fishman notes that, because of background differences, standardized tests may be somewhat biased with respect to blacks. Thus, he doubts that these tests can completely measure the potential of black students and results should be interpreted with caution.

Clark and Plotkin also doubt the predictive capability of standardized tests. Their basis for concern stems from a longitudinal study they performed on black students throughout the country (Clark and Plotkin, 1964:1). These black students had standardized test scores which were lower than the national average. However, the black student's graduation rate was much higher than the national

average. In addition, a number of the black graduates attended what Clark and Plotkin term "prestigious schools" (i.e., Ivy League).

These early suggestions prompted an increased effort to examine black student success factors (Funches, 1965:52-54; Munday, 1965:157-160; Hills and Stanley, 1968:241-242; Cleary, 1968:115-124; Thomas and Stanley, 1969:203-215). Researchers have attempted to determine: (1) if standardized tests are a reliable measure of success for blacks and (2) if standardized tests predict success differently for blacks. The findings of this research are important to the prediction of black candidate success.

The subject of test bias was addressed by Cleary in a study of black and white university students (Cleary, 1968:115-124). She found that the slope of the regression line for blacks (using college GPA as the dependent variable) was not significantly different from the regression line of white students. This finding was true for both predominantly black colleges and integrated colleges. Thus, Cleary suggests that standardized tests are not significantly biased against blacks and they can be used as reliable predictors of success.

The importance of standardized tests in predicting black student success is a subject that has also

received considerable attention. Unlike the early suggestions of Fincher and Clark and Plotkin, later studies have found that SAT/ACT scores are good predictors of black student success. Furthermore, while the combination of SAT/ACT and HSGPA best predicts black student success (like all other students), SAT/ACT often exceeds the predictive capability of high school GPA (Funches, 1965:52-54; Munday, 1965:157-160; Cleary, 1968:115-124; Thomas and Stanley, 1969:203-215).

Munday conducted a study of five predominantly black colleges (Munday, 1965:157-160). He found that ACT had a higher predictive capability for freshman success than did high school grades. In contrast to this, a national sample given the same year found that high school grades were as predictive, and often better, than standardized scores for determining freshman success of other groups. A 1965 study of predominantly black colleges in Mississippi was conducted by Funches (Funches, 1965:52). His findings helped confirm Munday's conclusions. Funches found that the ACT scored higher in predictive capability of black freshman than did HSGPA.

Funches also examined black students who had obtained lower high school grade point averages than their black contemporaries, but had higher ACT scores.

Some of these students actually had first year college GPAs that were higher than the blacks from the superior high school GPA group. Cleary used SAT scores (instead of ACT) as the independent variable in her study and produced similar findings (Cleary, 1968:115). SAT scores were more predictive of the black student's success than high school GPA.

One final study is noteworthy. This study, conducted by Thomas and Stanley, reinforced the findings of the others (Thomas and Stanley, 1969:203-215). However, the researchers did find that high school grades were the best predictor of success for black females. This predictive capability was greater than those exhibited by black males and white males. This is significant because it seems to refute any claims that black student's high school HSGPA is not as predictive due to a weak school system. If this were the fact, one would expect that high school GPA would be less predictive for black females as well.

We see that researchers tend to disagree on the level of predictive capability of academic factors for black students. However, regardless of the researcher's opinion, there is one common trend. All researchers tend to agree that academic factors affect black students differently than others. This fact shows that predicting black candidate success may

differ from predicting the success of other officer candidates.

Having established the fact that test scores and high school GPA may affect black candidate success prediction differently than others, there is also evidence that suggests that other individual factors may play a significant role in predicting black candidate success.

Several factors outside the realm of academics have been shown to affect black student success at the university level. Clark and Plotkin, when studying the correlates of success, found that the black graduates in their study demonstrated a high level of motivation (Clark and Plotkin, 1964:1). Factors which affected a student's motivation base were: (1) which university he attended; (2) his parents occupation; (3) whether his parents were college graduates; and (4) his degree of participation in extracurricular activities. Of the four factors mentioned above, parental influence and a sense of belonging (i.e., presence in extracurricular activities) were most important.

The black student's sense of belonging has continued to surface recently as an important factor in predicting success. A 1988 study was conducted at Clemson University to identify factors that contributed to black student withdrawal (McClung, Waddle, and

Harris, 1988:54-56). Like other studies, the authors at Clemson also found that SAT/ACT and high school HSGPA were significant predictors of black student success. However, their second finding sheds light on the nature of other predictors which affect black students.

They found that involvement in organizations and holding positions of leadership were two factors that were almost as important as the traditional factors (i.e., SAT/ACT, HSGPA) in predicting black student success. Interestingly, it did not matter whether the black students participated in a predominantly black organization or a predominantly white organization. The lack of alienation seemed most important.

The importance of parental guidance has also been cited in recent literature that examines black student success factors. One such finding was noted by Hubert Blalock Jr. In his book "Race and Ethnic Relations," Blalock suggests that family environment is an extremely important factor in determining the success of a black student. He addressed factors that impact a person's educational level, income, and occupation. He found an interrelationship between the father's education and occupation, intelligence levels, and income.

Blalock insists that blacks are more strongly influenced by the perception of opportunity and a belief about the degree of control they have over their own environment than others. He also concluded that there must be different mechanisms that motivate minority and Caucasian students to attain a higher level of education (Blalock, 1982:1).

In addition to the findings addressing black university students, there is evidence that non-academic factors may prove important in the Air Force officer training environment. First, Air Force accession statistics show that non-academic factors may affect the officer training process. Traditionally, a large percentage of Black officer accessions come from the South (Williams, 1992). This fact was confirmed by a study that stated that 39 percent of Air Force Black officer accessions during the period 1980 through 1985 came from the southern states (Kostiuk, 1989:7). These states contain a significant portion of the traditionally Black universities (see Figures 4 and 5). The number of accessions that came from southern states was disproportionate, given the fact that the largest percentage of the black "potential pool" attended universities in the Northeast during this time period (Kostiuk, 1989:7).

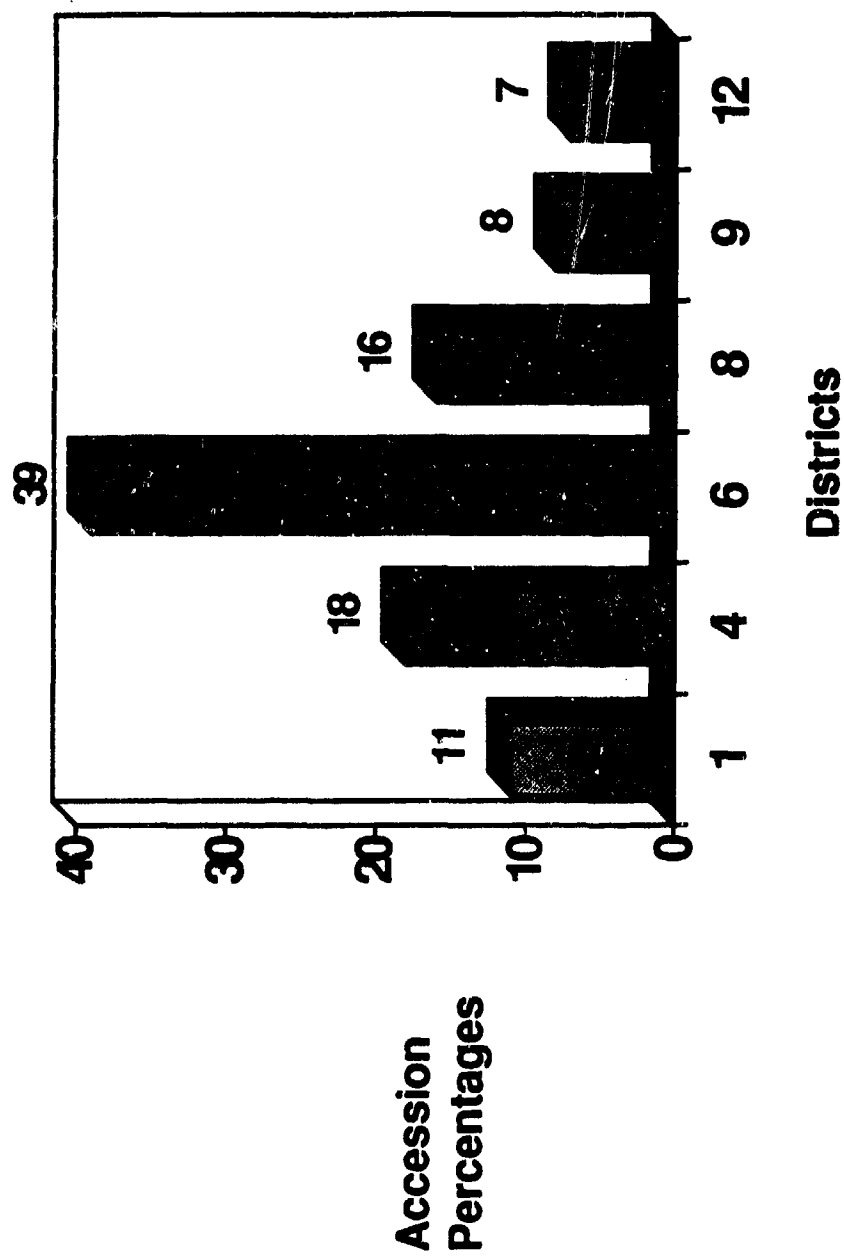
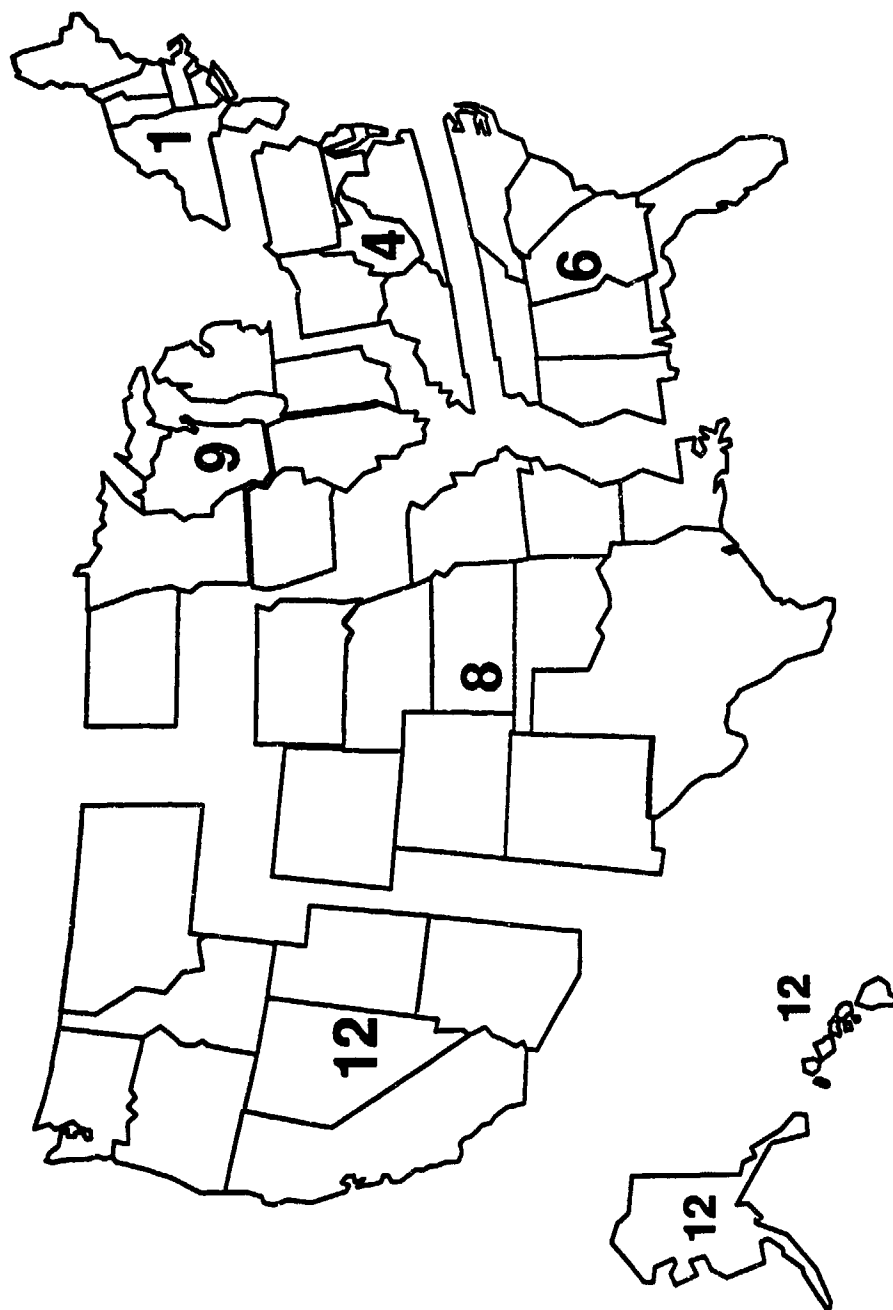


Figure 4
Air Force Black Officer Accession Percentages by Recruiting District
(Adapted from Kostuk, 1989)



If black candidates were being recruited in accordance with the potential pool percentages, the largest percentage of the graduates should have come from Northeastern states. If this is not the case, it suggests unequal black attrition rates between students from different areas of the country. Thus, a black student's area of origin may be a factor in determining his success.

Secondly, there is evidence which suggests a heightening of racial tensions at the Air Force Academy (Miller, 1993:1). There are documented reports which show an increased trend of racially motivated incidents in the past two years. These incidents have ranged from the use of racially offensive language to physical assaults.

In one instance, a black female cadet's room was raided in the middle of the night. During this raid, shaving cream bombs were thrown into her room along with a note saying that she had fulfilled her "quota" and should leave the academy (Miller, 1993: Tab 1). In another instance, during a meal formation, a cadet who was apparently dissatisfied with his waiter's service commented on his critique form: "The waiter ought to go back to Africa and learn how to pick bananas" (Miller, 1993:2).

There is also evidence that certain black students are losing faith in the institution because the offenders in these cases seem to go unpunished. These types of impressions may erode the motivational bond between individual and organization that has proven to be vital to officer candidates (Butler, Lardent, and Miner, 1983:506).

In summary, evidence suggests that the strongest predictors of black officer candidate success are the same as those for all other candidates (e.g., SAT/ACT, high school HSGPA). However, the relative importance of the predictors may be different between black candidates and other candidates. In addition, there is evidence that suggests that there are other factors besides test scores and HSGPA that may have a significant effect on black officer attrition.

Conclusion

This literature review has determined the two topics which help to best understand the nature of black officer candidate attrition. The first topic was the history of minority officer accession policy. The evolution of accession policy demonstrated how recruiting and attrition have affected decision-making. While both factors influence black officer procurement, recruiting has received the most attention. However,

current trends suggest that aggressive recruiting alone is no longer a sufficient strategy. Other factors that affect the commissioning process should also be addressed. On the basis of the current turnover rates for black officer candidates, attrition seems to be one commissioning factor that deserves attention.

The second topic is turnover theory. This theory lays the groundwork for understanding the nature of black officer candidate attrition. General attrition studies show two primary factors that affect success: organizational factors and individual factors. Through military studies, university studies, and minority studies, individual factors have been most important in the prediction of success. In addition, for university students, SAT/ACT and high school GPA are the most potent individual predictive factors. While SAT/ACT and high school GPA are also the best predictors of a black student's success, the importance of the factors seems different. A black student's success is often predicted more accurately by the results of standardized test scores. In contrast, other student's potential is best determined through the use of high school GPA.

Finally, blacks seem to be driven more by factors other than test scores and high school averages. While there may be several of these important factors, the

most influential one seems to be the black student's motivational base.

III. Methodology

Introduction

The purpose of this study is to determine how well measures of academic achievement and area of origin predict success or failure in the officer commissioning process, and whether the predictors effect black officer candidates differently than non-blacks. Officer candidates from the U. S. Air Force Academy (USAFA) and the Air Force Reserve Officer Training Corps (AFROTC) were examined. Officer Training School (OTS) candidates were not considered in this study.

Investigative Questions

In order to determine the relationship between the predictors and officer candidate attrition, the following questions were addressed:

1. How predictive of success /failure are Scholastic Aptitude Test (SAT)/American College Test (ACT) scores and HSGPA for USAFA officer candidates? Is there a significant difference in this predictive capability for blacks and other candidates?
2. How predictive of success/failure are SAT/ACT scores and AFOQT scores for AFROTC officer candidates? Is there a significant difference in this predictive capability for black and other candidates?

3. How predictive of success/failure is area of origin for USAFA officer candidates? Is there a significant difference in this predictive capability for blacks and other candidates?

Hypotheses

In relation to the investigative questions, the following hypotheses were tested:

1. H_0 : The predictive effect of academic variables is not significantly different for black and other officer candidates.

2. H_0 : The predictive effect of area of origin is not significantly different for black and other officer candidates.

Populations Examined

There were two populations of interest for the purposes of this study: (1) USAFA officer candidates and (2) AFROTC officer candidates. Thus, all inferences drawn in this study are attributed to these populations.

Samples

From the populations, a sample of officer candidates entering the two programs during the period from 1983 to 1992 were examined. In the case of USAFA, the entire group of 16,612 officer candidates (1024 blacks and 13,588 others)

entering during this period was examined. For AFROTC, a stratified, random sample of 6482 officer candidates (943 blacks and 5539 others) enrolled during this period was examined. Disproportionate stratification was necessary in order to obtain a large number of black AFROTC cadets. Many of the black AFROTC cadets included in the sample came from historically black colleges and universities.

Variables Examined

The predictor variables examined in this study were the candidate's: (1) standardized test score (SAT or ACT), (2) high school grade point average (HSGPA), (3) Armed Forces Officer Qualifying Test (AFOQT) scores, and (4) location of high school attendance.

Data Collection/Preparation

Statistical data was collected from USAFA and ROTC databases for all officer candidates entering the institution between the years 1983 and 1992. This sample of cadets was divided into two groupings: (1) black officer candidates and (2) other officer candidates. Due to the data collection methods of the two commissioning sources, a unique set of academic predictor variables was provided in each database. The following sections describe the unique characteristics of these predictor variables and any manipulations that were required.

USAFA Variables. For the case of USAFA, the variables of interest that were provided in the database included SAT verbal, SAT math, ACT verbal, ACT math and high school score. The SAT tests are reported on a scale of 0-800. The ACT tests are reported on a scale of 0-36. High school score was a measure of high school rank taking into account class size. High school score is reported on a 200-800 scale. The statistical analysis performed in this study required one standardized test score. Since SAT scores were reported for some USAFA candidates and ACT scores for others, all ACT scores were converted to equivalent SAT scores. This was accomplished by converting each ACT score to a standard score and multiplying mean SAT score by this standard score. The equation for converting ACT scores to SAT scores was as follows:

$$S_C = ((x_a - \mu_a / \sigma_a) \times \sigma_s) + \mu_s \quad (1)$$

where

S_C = Converted SAT score

x_a = ACT raw score

μ_a = ACT mean score

σ_a = ACT standard deviation

μ_s = SAT mean score

σ_s = SAT standard deviation

The statistics for the SAT and ACT were provided by the CEEB and ACTP, respectively. The mean and the standard deviation for the SAT tests were based on the 1992 national average

(The College Board, 1992:9). The mean and standard deviation for the ACT were based on the 1989 national average of college bound seniors. The year 1989 was used because after October 1989 the ACTP changed the Achievement Tests (Schiel, 1993). These ACT scores were applicable because the USAFA cadets took the test prior to the change.

AFROTC Variables. A sample of 6482 AFROTC cadets was provided by HQ AFROTC/XP, Maxwell AFB AL. In this sample, each candidate's standardized test score was recorded as an actual or equivalent SAT score. These SAT scores were reported as total scores on a scale of 0-1600. In addition, AFOQT verbal and AFOQT quantitative scores were reported for AFROTC candidates. AFOQT scores are reported on a scale of 0-99. Area of high school attendance was not provided in the AFROTC database.

Standardized Test Scores. The effect of converting ACT scores to SAT scores for USAFA cadets was minimal. Although, there were some minor differences in measurement for the two standardized tests, it should be noted that the relative measurement was the same. The SAT is a standardized test administered by the College Entrance Examination Board (CEEB). The ACT is a standardized test administered by the American College Testing Program. (ACTP) The ACT is supposedly better suited to test a student's aptitude for collegiate study, whereas the SAT is designed to measure a student's level of success in high school.

(Schiel, 1993). Nevertheless, both tests are used by colleges and universities throughout the nation for the purposes of determining admissions status and predicting academic performance.

Plan of Analysis

The data analysis consisted of a three phase process: (1) sample characteristics were examined for observable trends, (2) discriminant analysis was performed to determine the adequacy of the predictor variables, and (3) for the USAFA candidates only, a geographic analysis was conducted using the χ^2 goodness of fit test to determine the relevance of area of origin.

Sample Characteristics

The predictor variable attrition codes and simple statistics for USAFA and AFROTC were examined to observe any apparent trends.

Attrition Codes. In both the USAFA and AFROTC databases, each candidate who entered training was assigned an administrative code that indicated if a candidate was successfully commissioned. If a candidate was not successfully commissioned, the code gave an indication of the reason (See Appendix 1). The distribution of attrition codes for black and other candidates was examined to discover any noticeable trends for either group.

Predictor Variable Simple Statistics. The means and standard deviations of each predictor variable were examined for successful and unsuccessful candidates in each group (i.e., blacks and others). Any distinguishable differences between successful and unsuccessful candidates were determined. The discriminant functions are based, in part, on these differences. (Klecka, 1980:43). The overall predictor variable means and standard deviations for each group were also examined to determine if there were any distinguishable differences between blacks and others.

Predictor Variable Correlation. In order to indicate the degree of interaction between predictor variables, correlation matrices were developed. Measured on a continuous scale of -1 to +1, these coefficients provide a measure of the strength of the linear relationship between two predictor variables (McClave and Benson, 1991:481). The degree of the relationship between predictor variables was important in this research. If two predictor variables are highly related, then using both of them will not increase predictive capability. In stepwise discriminant analysis (discussed below) if a particular predictor variable did not enhance the predictability of the equation, it was not included. One reason for this lack of enhancement is often a high degree of correlation with another predictor variable.

Restriction of Range. Cadets who have been accepted to USAFA and AFOTC have met minimum standardized test score criteria. As a result, the distribution of standardized test scores for officer candidates was restricted in range. That is, the range of scores for officer candidates was smaller than the range of scores for all standardized test takers. This restriction in range reduces the size of the correlation coefficient (Guion, 1965:141). As a result, these correlation coefficients would not reflect the true relationship between the predictor variables. Instead, they would only reflect the relationship for officer candidates. To compensate for this restriction in range, the correlation coefficients for the predictor variables were adjusted. This adjustment was done using the following formula:

$$R = r (\Sigma/\sigma) / [1 - r^2 + r^2(\Sigma^2/\sigma^2)]^{1/2} \quad (2)$$

Where Σ and σ represent the predictor variable standard deviations for the unrestricted and restricted situations, respectively, and R and r represent the corresponding correlation coefficients (Guion, 1965:141).

Discriminant Analysis

Discriminant analysis was used to determine the capability of the independent variables to predict success or failure in the commissioning process. Discriminant analysis is a technique in which the criterion variable is classified as two or more mutually exclusive groups that are

related to one or more independent variables (Klecka, 1980:8). The independent variables must also be measured at the interval level of measurement (Klecka, 1980:9). Thus, discriminant analysis was suitable for our study since the criterion is dichotomous and classified as two mutually exclusive groups--those who were commissioned and those who were not. Furthermore, the criterion is related to several independent variables that are measured at the interval level (i.e., SAT/ACT, AFOQT, and HSGPA).

Our discriminant analysis consisted of three phases: (1) a stepwise discriminant analysis, (2) a linear discriminant analysis, and (3) a canonical discriminant analysis.

Assumptions. A discriminant analysis is based upon several assumptions (Klecka, 1980:11). Our sample data met most of the applicable assumptions by visual inspection. However, the following assumptions had to be tested:

(1) The covariance matrices for each group must be approximately equal.

(2) Each group must be drawn from a population with a multivariate normal distribution on the discriminating variables (Klecka, 1980:11).

Assumption number (1) was of particular interest since meeting it allows the use of the simplest form of discriminate analysis, linear discriminate function analysis (Klecka, 1980:9-10).

The SAS statistical program was used to test assumptions (1) and (2). In order to determine if assumption (1) was being met, the chi-square (χ^2) test of homogeneity of the within-group covariance matrices was conducted (Morrison, 1990:294-295). If the assumption of equality of the within-group covariance matrices is not met, the discriminant analysis can be very inaccurate (Tabachnick and Fidell, 1983:301). The (χ^2) test of homogeneity tests the null hypothesis of equal covariance matrices (Morrison, 1990:294-295). The authors concluded that the covariance matrices were approximately equal if the chi-square test of homogeneity failed to reject the null hypothesis at a significance level of $p < 0.10$.

Assumption (2) required that each group be drawn from a multivariate normal distribution. This assumption was protected in all samples by the central limit theorem since the sample sizes were relatively large (Tabachnick and Fidell, 1983:78). To provide further support for the assumption, frequency histograms, box plots, and normal probability plots for each group were developed and visually inspected for the appearance of normality. These graphical evaluations were supplemented by measures of skewness, and the Wilkes-Shapiro test ($n \leq 2000$) or the Kolmogorov-Smirnov test ($n > 2000$).

Skewness measures deviations from symmetry of a normal curve. The closer this measure is to zero, the stronger the

support for the normality assumption (Lohman, 1985:34). The Wilkes Shapiro Test and the Kolmogorov-Smirnov test the null hypothesis of normality (SAS, 1982:580). If the Wilkes-Shapiro test statistic was greater than 0.90 or the Kolmogorov-Smirnov test statistic was less than 0.10, the sample passed the normality test. Given the large sample sizes, if the sample passed any of the visual inspections of physical tests, the authors concluded that assumption 2 was met.

Outliers. The discriminant analysis procedure is very sensitive to outliers in the sample data. Therefore, any significant outliers should be either (1) transformed, or (2) removed prior to the discriminant analysis (Tabachnick and Fidell, 1983:300). As a result, any predictor variable values in excess of three standard deviations from the mean were removed prior to the analysis.

Stepwise Discriminant Analysis. In this study, the researchers chose predictor variables that we suspected were valuable in predicting commissioning success. However, in order to scientifically determine which predictor variables were significant in determining the criterion, a stepwise discriminant analysis was used. A forward stepwise procedure was conducted in which the variables were entered one at a time to determine the most effective combination of variables. Stepwise discriminant analysis must use a method to select variables to enter the model (Klecka, 1980:54).

The selection criteria employed in our stepwise procedure was the significance level from an F-test. A significance level of 0.15 was used as the F-statistic criterion for entry/exit from the classification function. This value was chosen because it was the default value in the SAS program. Each time a variable was entered, the F-statistic was recalculated for each of the entered variables. If any of the entered variables was not significant at the 0.15 level, they were dropped from the equation.

For each step, the canonical correlation for a predictor variable was also computed. This statistic, which is measured on a continuous scale of 0 to +1, provides an indication of the degree of relatedness between the discriminant function and the criterion (Klecka, 1980:36).

Linear Discriminant Function. In order to determine the accuracy of the predictor variables in predicting officer candidates as successful or non-successful, two classification equations were developed for our analysis, one equation for those who graduated (the graduation function), and another for those who did not graduate (the attrition function). These classification functions were based on a simple linear combination of the discriminating variables. The linear combination represented the differences in the predictor variables for those who were successful and those who were not (Klecka, 1980:42-43). In order to come up with one equation, it was necessary to

subtract the attrition function from the graduation function, thus yielding one discriminant function. The discriminant classification function was of the form:

$$D_i = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + \dots + b_p X_p \quad (3)$$

where

D_i is the score on the discriminate function i .

b_0 is a constant.

The b_p 's are the classification coefficients.

X 's are the raw values of the predictor variables (Klecka, 1980:43).

Cross-Classification. In order to evaluate the accuracy of the linear discriminant functions, they were tested using the sample data. That is, the sample data for candidates who were known to be successful or unsuccessful were fed into the equation to see if the equation predicted them as such. This process is referred to as cross-classification. If a candidate's discriminant score was greater than zero, that candidate was classified as successful. If a candidate's score was less than zero, that candidate was classified as unsuccessful. In theory, a discriminant score of exactly zero would mean that, for each predictor variable, a candidate attained the mean value of that variable.

There were two types of error that were possible in our cross-classification process. Type I error (a "miss") occurred when the function classified a successful candidate

as unsuccessful. If the predictor variables were used as selection criteria in the future, the number of misses would indicate the potential to exclude officer candidates who would actually be successful. Type II error (a "false positive") occurred when an unsuccessful candidate was classified as successful. The number of "false positives" present indicates the potential to select officer candidates who would not be successful. The purpose of using predictor variables is to improve or eliminate these types of errors.

Canonical Discriminant Function. As discussed earlier, the linear discriminant function contained unstandardized coefficients that were in the units of each predictor variable. This function was useful for the purposes of classification since it allowed unstandardized, raw scores to be fed into the equation to predict success or failure. Although this form of the equation was excellent for prediction, it was not useful for comparing the values of the discriminant function coefficients for one group to those of another (i.e., the blacks to the others). To completely understand the nature of the group differences it was necessary to determine the absolute magnitude of each predictor variable in the function. While the relative order of importance can be the same for both groups, the absolute magnitude for a predictor variable can be different for each group.

Therefore, in order to discover the contributions of the individual variables to the criterion, it was necessary to develop a canonical discriminant function that contained standardized coefficients. Although it is derived differently, the form of the canonical discriminant function is similar to that of the linear discriminant function (Klecka, 1980:15-23). However, in order to obtain standardized coefficients, the canonical discriminant function is necessary (Klecka, 1980:22-23). The standardized canonical function does not contain a constant and is of the form:

$$D_i = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_p X_p \quad (4)$$

where

D_i is the score on the discriminate function i .

The β_p 's are the standardized classification coefficients.

X 's are the standard values of the predictor variables (Tabachnick and Fidell, 1983:303-4).

Geographic Analysis

A geographic analysis was performed on the USAFA cadets in order to determine if the area of the country in which an officer candidate attended high school had an impact on success. This analysis was not performed on the AFROTC cadets because the database did not indicate of the location of high school attendance. In order to conduct this

analysis, six recruiting districts were analyzed. The six recruiting districts were divided according to relative areas of the country. Districts 1 and 4 consisted primarily of Northeastern states, District 6 consisted of Southeastern States, Districts 8 and 9 consist of Midwestern States, District 12 consisted of Western States, including Alaska and Hawaii, and District 14 consisted of territories outside the U.S. (e.g., Puerto Rico; see Table 3).

The Chi-Square (χ^2) Goodness of Fit Test. The methodology of the geographic analysis was designed to determine if there was a difference between the frequency distribution of USAFA officer candidates and the frequency distributions of successful and unsuccessful candidates among the geographic regions. Since the distribution of successful candidates approximated a multinomial, the chi-square (χ^2) goodness of fit test was used (McClave and Benson, 1991:1008-10). The χ^2 goodness of fit test was conducted in the following manner:

1. The states of high school attendance for all USAF officer candidates were grouped into recruiting regions.
2. A contingency Table was developed that contained the observed and expected percentages of successful and non-successful candidates in each region.
3. The χ^2 statistic was computed based on the observed and expected frequencies.

4. The observed significance level for the test was determined.

The χ^2 goodness of fit test compared the frequency distribution of all USAFA officer candidates (i.e., successful and unsuccessful) to the frequency distribution of successful officer candidates. The null hypothesis was that there was no difference between these frequency distributions. The alternative hypothesis was that there was a difference. If the null hypothesis was rejected in favor of the alternative hypothesis, the researchers concluded that area of high school attendance did have an impact on success in the Air Force officer commissioning process.

A contingency Table for the χ^2 test was given. This Table displayed the difference between the observed and expected frequency of success within a given region. The Table allowed the researchers to determine whether candidates within a given region performed better or worse than expected and the magnitude of the difference.

The test was conducted for black officers and other officers. The results of the tests were compared to determine if there was any difference in the relationship of geographic origin and commissioning success for the two groups of officers.

Measurement Issues

Reliability. Reliability is the amount of stability a measurement procedure possesses (Emory and Cooper, 1991:185). The primary criterion for reliability is consistent results. The measurement in our study was very reliable due to the nature of the variables examined. Standardized test scores and AFOQT scores have proven to be very reliable measures of performance which exhibit consistent results. In addition, these tests are computer scored, reducing the risk of recording error. Furthermore, the geographic information in the study was maintained on computerized databases, again reducing the potential for recording error.

Validity. Validity is the extent to which a difference observed while using a measuring tool is a true effect difference, as opposed to a difference attributable to extraneous error (Emory and Cooper, 1991:180). Validity of measurement determines whether the instrument actually measures what the researcher wishes.

Criterion-related validity was a concern in our study. Criterion-related validity measures our ability to use the instrument for estimating purposes. In our study, the measurement instrument was the predictor variables. These predictor variables have historically proven to be very valid for predicting academic performance. However, the

validity that they will have for predicting the criterion of this study, success in officer commissioning process, will be determined during the data analysis.

Conclusion

This chapter presented the methods used to conduct this study. The purpose of this study was to determine how well measures of academic achievement predict success or failure in the officer commissioning process and whether the predictors effect blacks differently from others. The study examined how predictive SAT verbal score, SAT math score, HSGPA and area of origin were in determining success or failure at the U.S. Air Force Academy during the period 1983 to 1992. For ROTC, the relevance of SAT score, AFOQT verbal, and AFOQT math in determining success or failure during the same period was examined. Discriminant analysis was used to determine the relevance of these predictor variables in predicting success during the commissioning process. In order to determine what relevance the area of high school attendance had on success or failure, the Chi-Square (χ^2) Goodness of Fit test was performed. This test determined if there was a significant difference between the actual and expected success in each region. The reliability and validity issues related to the study were also discussed.

IV. Results and Analysis

Introduction

The chapter consists of two primary sections. First, the findings and analysis from the US Air Force Academy (USAFA) are presented. This is followed by findings and analysis from the Air Force Reserve Officers Training Corps (AFROTC). A discriminant analysis and a chi-square goodness of fit test were performed on the USAFA data. In addition, a discriminant analysis was performed on the AFROTC data.

Analysis of USAFA Officer Candidates

The USAFA officer candidate sample for the years 1983 through 1992 consisted of 1,024 black candidates and 13,588 other candidates. Of the black candidates, 376 did not complete training, representing an attrition rate of approximately 37 percent. Of the 13,588 other officer candidates, 4,231 were removed from training. This represented an attrition rate of approximately 31 percent.

An examination of the attrition codes given to non-successful candidates shows a notable trend. There was a significant difference in the percentages of black and other candidates who were officially released for academically related reasons (i.e., academics and/or aptitude). Of the non-successful blacks, approximately 53 percent were

released for academic reasons while only 20 percent of the other candidates received academic dismissals.

Upon initial inspection it would seem that black candidates are affected more by academics and their attrition would be more closely linked to the predictors in this study.

Sample Characteristics.

Means of Predictor Variables. The means and standard deviations for each predictor variable, by groups, are shown in Tables 1 and 2. The predictor variables used were high school grade point average (HSGPA), SAT verbal scores (SAT-V), and SAT quantitative scores (SAT-Q). A portion of the SAT scores were obtained by converting ACT scores into SAT equivalents.

Those candidates who did not complete training had, on average, a lower high school GPA as well as a lower SAT score. This was true for both black and other candidates. However, the differences in scores are small. Thus, the actual amount of predictive capability possessed by the predictors may be limited.

Finally, the standard deviations of the SAT scores show a restricted range for both black and other candidates. The national average standard deviations for SAT-V and SAT-Q are 112 and 126 respectively (CEEb, 1993).

Table 1. Black Officer Candidate Predictor Variable Means
(Adapted from USAFA database)

CLASS	SAT-V MEAN	SD	SAT-Q MEAN	SD	HSGPA MEAN	SD
ALL	517.91	54.35	584.21	39.55	585.26	86.56
GD	519.79	54.61	586.76	42.21	594.52	83.77
AT	514.68	53.83	579.81	34.10	569.32	89.05

(ALL=All candidates, GD=successful candidates, AT=casualties)

This restriction produced attenuated correlations between the predictor variables, which distorted their actual degree of interrelatedness. The correlation coefficients were corrected (in accordance with the procedure in chapter 3) to show the actual correlation between the predictor variables.

Table 2. Other Officer Candidate Predictor Variable Means
(Adapted from DPXOA database, 1993)

CLASS	SAT-V MEAN	SD	SAT-Q MEAN	SD	HSGPA MEAN	SD
ALL	558.95	64.09	612.51	65.60	632.50	91.28
GD	561.96	63.50	615.05	66.44	640.68	88.35
AT	552.29	64.89	606.88	63.36	614.40	94.97

(ALL=All candidates, GD=successful candidates, AT=casualties)

Correlation Among Predictor Variables. Tables 3 and 4 show the Correlation among predictor variables for each group. All correlation coefficients are corrected for restriction in range. The variables SAT-Q and HSGPA are relatively independent of each other (for both groups) and will add to predictability when combined. The predictive ability of SAT-V will tend to be diluted due to its interaction with SAT-Q and HSGPA.

Table 3. Black Candidate Predictor Variable Correlation
(Adapted from USAFA database)

VARIABLE	SAT-V	SAT-Q	HSGPA
SAT-V	1.00	0.48	0.16
SAT-Q	0.48	1.00	-0.05
HSGPA	0.16	-0.05	1.00

Table 4. Other Candidate Predictor Variable Correlation
(Adapted from USAFA database)

VARIABLE	SAT-V	SAT-Q	HSGPA
SAT-V	1.00	0.41	0.27
SAT-Q	0.41	1.00	0.08
HSGPA	0.27	0.08	1.00

Discriminant Analysis Results.

Assumptions. The normality and equal covariance assumptions were both tested.

The HSGPA distributions of the black and other candidate samples were both tested to determine if approximately normal distributions existed. The authors used a heuristic of $W \geq .90$ and $D \leq .10$ as an accept/reject criterion and concluded that the HSGPA distributions were approximately normal. The distributions for SAT-V and SAT-Q were by definition normally distributed, having been drawn from a normally distributed population.

A chi-square test of matrix homogeneity was used to compare the covariance matrices of successful and non-successful candidates. The chi-square test used the null hypothesis that both matrices were equal. The null hypothesis was not rejected (at $p < .10$) and the authors determined that the matrices were approximately equal.

Stepwise Analysis. A stepwise discriminant procedure was used on both the black and other officer candidate populations to determine the most efficient discriminant/classification function, given the predictor variables available. The results of the analysis are shown in Tables 5 and 6. The SAS default significance level of 0.15 was used as the F-stat criteria for entry/exit from the classification function.

The analysis of the black candidates shows that: (1) each variable, when taken alone, has some level of predictive capability; (2) when all the predictors are considered together, SAT-Q and HSGPA form the most efficient predictive (i.e., classification) function; (3) the predictive capability of this function is quite limited.

The first conclusion is shown by the zero order (i.e. step zero) F-stat of each variable; each one is significant at a 0.15 level.

The second conclusion is shown in step three of the stepwise analysis. The successful and non-successful black candidates were distinguishable only in the areas of HSGPA and SAT-Q. The zero order F-stat for SAT-V displays a very small difference between black candidates in this criterion. In addition, SAT-V has the greatest correlation with the other predictor variables (see Table 3). Thus, the interactive effect between verbal scores and the other predictors negates any significant contribution by SAT-V in

the combined function.

Finally, it is important to note that even though SAT-Q and HSGPA are significant at the 0.15 level, their correlation to attrition is quite low. Thus, they may prove limited in their ability to accurately predict success and failure.

Table 5. Black Candidate Stepwise Analysis
(Significance level to Enter/Stay = 0.15)

Step	Variable Entered	Variable Removed	Partial R-2	F Stat	P Val	Canonical Correlation
0	GPA	----	.0197	20.55	.0001	----
	SAT-Q	----	.0072	7.40	.0066	----
	SAT-V	----	.0021	2.11	.1469	----
1	GPA	----	.0197	20.55	.0001	.141
2	GPA	----	.0203	21.15	.0001	.164
	SAT-Q	----	.0078	8.00	.0048	.164

The results of the stepwise procedure for the other officer candidates are the same as for blacks except: (1) the variable SAT-V remains in the classification function and (2) each variable, when taken alone, has a stronger level of predictive capability for other candidates than for blacks. Similar to the effect of SAT-V on the black candidates, SAT-V contributed little to overall predictability of other candidates when combined with the SAT-M and HSGPA. However, unlike black candidates, the other officer candidates showed a greater difference in mean SAT-V scores between successful and non-successful candidates. Consequently, the F-stat for SAT-V remained

significant (at the 0.15 level) when combined with SAT-Q and ESGPA, and all variables were included in the final classification function of the other candidates.

In addition, the zero order correlation of the predictor variables is greater for other candidates than for blacks. Thus, each of these variables (when taken alone) can predict attrition for other candidates more efficiently than for blacks.

Finally, note that like the black candidates, the combined classification function of the other candidates is not highly correlated to attrition. Thus, this function will also be limited in its predictive capability.

A final comparison of the stepwise procedure shows that the dominant characteristic for both groups (i.e., blacks and others) is a very low correlation between the predictor variables and the criterion measured (i.e. attrition).

Table 6. Other Candidate Stepwise Analysis
(Significance level to Enter/Stay = 0.15)

Step	Variable Entered	Variable Removed	Partial R-2	F Stat	P Val	Canonical Correlation
0	GPA	----	.0178	245.98	.0001	----
	SAT-V	----	.0049	66.53	.0001	----
	SAT-Q	----	.0033	45.40	.0001	----
1	GPA	----	.0178	245.98	.0001	.134
2	GPA	----	.0169	233.49	.0001	.141
	SAT-Q	----	.0024	33.10	.0001	.141
3	GPA	----	.0145	200.54	.0001	.145
	SAT-Q	----	.0016	22.32	.0001	.145
	SAT-V	----	.0009	11.85	.0006	.145

Cross-Classification The SAS statistical package produced the following classification functions:

Black Candidates

$$D = -4.23018 + .0047(\text{SAT-M}) + .0035(\text{GPA})$$

Other Candidates

$$D = -2.52510 + .0014(\text{SAT-M}) + .0030(\text{GPA}) + .0011(\text{SAT-V})$$

The 10-year scores attained by the black and other officer candidate populations were each loaded into the respective functions and each candidate was classified by the applicable function. This procedure determined the predictive efficiency of the classification functions. The results are shown in Tables 7 and 8.

The black candidate classification shows that, as expected, the function is limited in its predictive capability. Of the 1024 prior candidates, 367 were misclassified. This represents an error rate of approximately 36 percent.

Table 7. Classification of Black Candidates

Candidates	Predicted to Succeed	Predicted to Fail	Totals
Successful (percentage)	632 (96%)	16 (4%)	648 (100%)
Unsuccessful (percentage)	351 (93%)	25 (7%)	376 (100)
Totals	983	41	1024

Table 7 demonstrates two types of error that are inherent in the function. The first type of error, known as a "miss", occurs when the function classifies a successful candidate as non-successful. The function is very robust with respect to this type of error. As Table 7 shows, only 16 (or 4 percent) of the successful candidates were misclassified in this manner. Thus, academic variables do seem to play a role in predicting success. In fact, a strong academic background seems to be a prerequisite, given the fact that almost all successful candidates were predicted correctly based on the academic variables used. So it is unlikely that a potentially successful candidate would ever be denied entry to a commissioning program based on his academic background. However, as the following paragraph shows, academic background alone does not ensure success.

While the prediction function is excellent in terms of miss error, it is highly suspect in regard to the second possible type of error. This type of error, known as a "false positive", suggests that a non-successful candidate would be classified as successful. Table 7 shows that non-successful candidates were misclassified 93 percent of the time. Thus, a candidate can have a strong academic background and still be unsuccessful in a commissioning program. In fact, predicting success solely on the basis of academic background can produce an extremely high false

positive error rate, as shown in Table 7. This type of error would seem most detrimental when attempting to predict attrition percentages for officer candidates. Thus, a researcher should exercise caution when attempting to use these academic measures alone to predict the success of an officer candidate.

Table 8 (other candidates) shows a similar pattern to that of the black candidates. The other candidates were misclassified in 4,217 of the 13,588 cases, representing an error rate of approximately 31 percent.

Like the black candidates, the other candidate source of error was almost exclusively attributable to false positives.

Table 8. Classification of Other Officer Candidates

Candidates	Predicted to Succeed	Predicted to Fail	Totals
Successful (percentage)	9348 (99%)	9 (1%)	9357 (100%)
Unsuccessful (percentage)	4208 (99%)	23 (1%)	4231 (100%)
Totals	13556	32	13588

In comparing the groups, they both demonstrate the same trends in classification. Both functions show a high rate of error, with the highest overall error occurring in the classification of black candidates. This confirms the earlier suggestion that the variables may have limited

predictive capability. In addition, the classification shows that the limitation is primarily a result of a high rate of false positive predictions.

This high rate of false positive error is primarily a result of the small differences in scores between successful and non-successful candidates (see Tables 1 and 2). The large overlap in distributions, combined with a low miss rate, produces significant false positive error. Again, caution should be used when attempting to predict the success of an officer candidate solely on the basis of the academic variables used in this study.

Comparison of Standardized Coefficients. The SAS statistical package produced the following standardized discriminant functions:

Black Candidates

$$D(\text{standard}) = .5335(\text{SAT-Q}) + .8620(\text{GPA})$$

Other Candidates

$$D(\text{standard}) = .2886(\text{SAT-Q}) + .8530(\text{GPA}) + .2154(\text{SAT-V})$$

Note that the relative order of importance of the predictor values will not change when the function is standardized. However, certain differences (i.e., between black and other candidates) can be determined. These differences are can be seen by examining the coefficient values of the predictor variables. Of the three variables examined, HSGPA is the strongest predictor of success for

both groups (.8620 for blacks and .8530 for others). SAT quantitative scores are more important to black candidate prediction (.5335 for blacks vs. .2886 for others), while SAT verbal scores are more important in predicting success for other officer candidates (0 for blacks vs. .2154 for others).

Finally, note that while the importance of the predictors varies between blacks and other candidates, these differences are not significant to the prediction of success for either group. This is due to the fact that the predictors, as a whole, are not very effective in predicting success for either group.

In summary, the discriminant/classification procedure provides several insightful findings. First, each academic predictor plays a role (though limited) in predicting success for both blacks and other officer candidates. Second, while the variables have limited capability in predicting success for both groups, the predictors are most limited in predicting black officer candidate success. Finally, these academic predictors, when used alone, greatly exaggerate the importance of academic background. Thus, using these variables alone to predict a candidate's potential success can cause extreme false positive error. This type of error is detrimental when attempting to control attrition.

Geographic Analysis. A chi-square goodness of fit test was conducted to determine if area of high school attendance had a significant effect on success in the commissioning process. The criteria used to compare districts was the expected versus actual frequencies of success and failure in the region (where the expected regional frequency was based upon the overall frequency of success and failure for the officer candidates). The null hypothesis stated that, for each region, the actual frequencies of success/failure were equal to the expected frequencies of success/failure. The results are shown in Tables 9 and 10.

For the black candidates, the goodness of fit test failed to reject the null hypothesis at a 0.005 level of significance. Thus, there were no significant differences between the expected and actual frequencies in the districts. This suggests that area of high school attendance is not significant in predicting success of black candidates.

Table 9. Chi-Square Expected vs. Actual Success (Blacks)

Districts	1	4	6	8	9	12	14
Chi-square expected success frequency	74	142	116	125	52	107	32
Actual success frequency	78	141	108	127	49	107	38
Difference	+4	-1	-8	+2	-3	0	+6

Table 10. Chi-Square Expected vs. Actual Success (Others)

District	1	4	6	8	9	12	14
Chi-square expected success frequency	1248	1426	1309	1694	1234	1743	700
Actual success frequency	1280	1480	1275	1663	1188	1729	742
Difference	+32	+54	-34	-31	-46	-14	+42

For the other officer candidates, the chi-square test rejected the null hypothesis at a 0.005 level of significance. Thus, area of high school attendance plays a role in predicting success for other candidates. Students from districts 1, 4 (both northeastern districts), and 14 (students from areas outside the 50 US states) were more successful than students from the remaining districts.

Analysis of AFROTC Officer Candidates

A sample of approximately 943 black and 5539 other ROTC officer candidates was examined in the analysis. In order to secure a sufficient number of black candidates, the sample included a disproportionate number of students from historically black universities. However, black candidates from all other regions of the country were also used in the sample.

Of the black candidates sampled, approximately 42 percent failed to complete training. The attrition rate for the sample of other candidates was approximately 33 percent.

Of the non-successful black candidates, approximately 46 percent were given academic attrition codes. Of the non-successful other candidates, approximately 26 percent were dismissed for academic reasons. Thus, on the surface, black candidate attrition seems more closely related to academic background.

Sample Characteristics.

Means of Predictor Variables. The means and standard deviations for each variable are shown in Tables 11 and 12. For the ROTC candidates, there was a distinct difference in the mean scores between black and other candidates. Also, when comparing differences between successful and non-successful candidates, another significant trend emerges. Those who were removed from training (i.e. non-successful cadets) had, on average, higher SAT scores than successful cadets. This was true for both groups (i.e. black and other candidates). Thus, it appears that cadets with stronger academic backgrounds leave

Table 11. Black Officer Candidate Predictor Variable Means
(Adapted from ROTC database)

CLASS	SAT MEAN	SD	AFOQT-V MEAN	SD	AFOQT-M MEAN	SD
ALL	910.60	164.60	35.50	22.30	36.90	21.80
GD	904.28	149.47	35.86	21.02	37.47	21.29
AT	919.09	183.00	34.98	24.00	36.19	22.66

(ALL=All candidates, GD=successful candidates, AT=casualties)

Table 12. Other Officer Candidate Predictor Variable Means
(Adapted from ROTC database)

CLASS	SAT MEAN	SD	AFOQT-V MEAN	SD	AFOQT-M MEAN	SD
ALL	1147.00	176.30	62.40	24.70	67.00	23.70
GD	1139.00	159.55	62.88	23.41	67.88	22.05
AT	1164.00	205.62	61.39	27.35	65.05	26.71

(ALL=All candidates, GD=successful candidates, AT=casualties)

the ROTC program more often. This shows that, although academic potential may play a role in predicting success for ROTC cadets, there may be other factors which are more important.

Correlation Among Predictor Variables. Tables 13 and 14 show the correlation matrices of the black and other officer samples (corrected for restriction in range). There is a relatively high degree of positive correlation among all the predictor variables. This high degree of interaction will tend to dilute the predictive power of the variables when they are combined in a classification function. Thus, these variables will lack the predictive capability attained by combining relatively uncorrelated variables. Hence, the predictive power of the combined function (i.e. SAT and AFOQT) may not differ greatly from a function which utilizes only one of the variables and the variables may prove to be an ineffective combination in terms of enhancing prediction.

Table 13. Black Officer Candidate Predictor Variable Correlation (Adapted from ROTC database)

VARIABLE	SAT	AFOQT-V	AFOQT-M
SAT	1.00	0.62	0.59
AFOQT-V	0.62	1.00	0.51
AFOQT-M	0.59	0.51	1.00

Table 14. Other Officer Candidate Predictor Variable Correlation (Adapted from ROTC database)

VARIABLE	SAT	AFOQT-V	AFOQT-M
SAT	1.00	0.58	0.56
AFOQT-V	0.58	1.00	0.55
AFOQT-M	0.56	0.55	1.00

Discriminant Analysis. A discriminant analysis was performed on the samples of ROTC candidates. The procedure mirrored the one conducted on the USAFA candidates, with the exception of the predictor variables used.

Assumptions. The ROTC cadets were tested with respect to the normality and equal covariance assumptions. The authors determined that both samples had approximately normal distribution with respect to SAT, AFOQT-V and AFOQT-M.

In addition, the chi-squared test of covariance matrices failed to reject the null hypothesis (at $p < .10$). Thus, the authors determined that the matrices were approximately normal.

Stepwise Analysis. The summary results of the stepwise analysis are presented in Tables 15 and 16. These

results are significant to the prediction of black candidate success. On the basis of an enter/stay criterion of 0.15, none of the predictor variables remain in the classification function. Thus, based upon this sample, these predictors have almost no predictive capability with respect to black candidates.

Table 15. Black Officer Candidate Stepwise Summary
(Significance level to Enter/Stay = 0.15)

Step	Variable Entered	Variable Removed	Partial R-2	F Stat	P Val	Canonical Correlation
0	SAT	SAT	.0004	0.355	0.551	----
	AFOQT-V	AFOQT-V	.0008	0.796	0.372	----
	AFOQT-M	AFOQT-M	.0020	1.866	0.172	----

For the other officer candidate sample, all of the predictor variables remained in the function at a 0.15 level of significance. Although the predictor variables were significant in the model for other candidates, one point should be noted. The correlation between the variables and the criterion (i.e. attrition) is very small. Thus, the classification function derived for the other candidates seems rather low in its predictive capability.

Table 16. Other Officer Candidate Stepwise Summary
(Significance Level to Enter/Stay = 0.15)

Step	Variable Entered	Variable Removed	Partial R-2	F Stat	P Val	Canonical Correlation
3	SAT	----	.0176	98.93	.0001	.141
	AFOQT-V	----	.0087	48.32	.0001	.141
	AFOQT-M	----	.0032	17.52	.0050	.141

Because the stepwise procedure produced no significant variables for the black candidate sample, a direct discriminant procedure was conducted on this sample. Using this procedure, SAS produces a classification/discriminant function regardless of the variable's significance level. The function derived was used to cross-classify the black candidates and to obtain standardized coefficients.

Cross-Classification. The raw classification functions produced by SAS are shown below:

Black Officer Candidates

$$D = 1.2984 + .00606 \text{ (AFOQT-V)} + .00654 \text{ (AFOQT-M)} - .00159 \text{ (SAT)}$$

Other Officer Candidates

$$D = 2.1698 + .00657 \text{ (AFOQT-V)} + .01094 \text{ (AFOQT-M)} - .00224 \text{ (SAT)}$$

The 10-year scores attained by the candidates in the sample were loaded in the appropriate functions and the cadets were classified. The results are shown in Tables 17 and 18. The results show that the function for the black candidates demonstrates the same error pattern as that of the other officers, even though the black candidate classification function was derived from variables which were determined to be insignificant. The black candidate function misclassified 382 of the 943 black students, an error rate of 42 percent. The other officer candidate function misclassified 1708 of the 5539 other candidates, an error rate of approximately 33 percent.

Table 17. Classification of Black Officer Candidates
(Adapted from ROTC database)

Candidates	Predicted to Succeed	Predicted to Fail	Totals
Successful (percentage)	537 (99%)	6 (1%)	543
Unsuccessful (percentage)	376 (94%)	24 (6%)	400
Totals	913	30	943

In addition, both the black and other candidate functions demonstrate a high degree of false positive error. So we see that the black candidate function predicts in a manner similar to the other candidate function. Thus, the three predictors are not very accurate for either group, despite the fact that they remained in the classification function for the other candidates.

This classification procedure shows that, similar to the USAFA environment, academic background plays a role in the success of ROTC cadets. However, academic factors alone come up well short in explaining the entire success process.

Table 18. Classification of Other Officer Candidates
(Adapted from ROTC database)

Candidates	Predicted to Succeed	Predicted to Fail	Totals
Successful (percentage)	3730 (99.8%)	9 (.2%)	3739
Unsuccessful (percentage)	1699 (94%)	101 (6%)	1800
Totals	5429	110	5539

Comparison of Standardized Coefficients. The SAS package produced the following standardized discriminant functions:

Black Officer Candidates

$$D = -.7009 \text{ (AFOQT-V)} + -.7421 \text{ (AFOQT-M)} + 1.3548 \text{ (SAT)}$$

Other Officer Candidates

$$D = -.5250 \text{ (AFOQT-V)} + -.8352 \text{ (AFOQT-M)} + 1.2690 \text{ (SAT)}$$

Among the three variables used, total SAT scores are most influential to success for both groups (1.3548 for blacks and 1.2690 for others). In addition, AFOQT-V is a slightly more predictive measure for blacks (.7009 for blacks vs. .5250 for others), while AFOQT-M is slightly more predictive for other candidates (.7421 for blacks vs. .8352 for others). However, like the USAFA findings, these comparisons must still be accessed in light of the fact that the predictor variables are not very efficient for classifying either group. Thus, these differences do not significantly effect the ability to predict success for either blacks or other candidates.

Conclusion

This chapter presented the findings of the discriminant analysis procedures performed on both USAFA and ROTC officer candidates. Also, the findings of the chi-square analysis performed on USAFA candidates were presented.

Overall, the most significant finding was that there is little correlation between the predictor variables used in this study and success/failure in the officer training process. The variables do play a role in predicting success. However, the variables significantly over-predicted success for cadets who did not complete officer training. Thus, using these variables alone to predict success in the officer training environment will tend to cause errors that will inhibit attempts to control attrition.

There were certain differences between black and other officer candidates with respect to the predictor variables. The most significant difference was that this group of variables predicts success more effectively for other candidates than for blacks (true for both ROTC and USAFA). However, because of the overall inefficiency of the classification functions, these differences do not effect prediction appreciably.

Finally, area of high school attendance does not predict success/failure for black USAFA candidates. However, the chi-square results suggest area of high school attendance is significant in predicting success for other officer candidates.

V. Conclusions and Recommendations

Introduction

The purpose of this study was to determine how well measures of academic achievement and area of origin predict success or failure in the officer commissioning process, and whether the predictors effect black officer candidates differently than non-blacks. Officer candidates from the U. S. Air Force Academy (USAFA) and the Air Force Reserve Officer Training Corps (AFROTC) were examined. This study does not apply to Officer Training School (OTS) candidates since they have completed college before becoming officer candidates.

Results Summary

The following is a summary of the major findings with respect to the investigative questions:

1. *How predictive of success /failure are Scholastic Aptitude Test (SAT)/American College Test (ACT) scores and HSGPA for USAFA officer candidates?* These traditional measures of academic success would appear to be very limited in their ability to predict success for USAFA officer candidates.

Is there a significant difference in this predictive capability for blacks and other candidates? The USAFA predictor variables appear to do a poor job of predicting

success for both groups of officer candidates. However, there seems to be a slight difference in the predictive capability. For black cadets, there was a 36 percent error rate in predicting cadets as successful or unsuccessful. For other cadets, the error rate was 31 percent. This indicates that academic variables have slightly less power in predicting success for black USAFA cadets.

2. *How predictive of success/failure are SAT/ACT scores and AFOQT scores for AFROTC officer candidates?* These predictor variables do not appear to be very effective in predicting success for AFROTC cadets.

Is there a significant difference in this predictive capability for black and other candidates? Although the predictive capability of the AFROTC variables appears to be poor overall, there seems to be a distinct difference for the two groups of officers. For black AFROTC cadets, there was a 42 percent error rate in predicting success or failure. For other AFROTC cadets, the error rate was 33 percent. This suggests that the AFROTC predictor variables have less relevance in predicting success for black officers than for other officer candidates.

3. *How predictive of success/failure is area of origin for USAFA officer candidates?* There appears to be a slight relationship between area of high school attendance and success for USAFA cadets.

Is there a significant difference in this predictive capability for blacks and other candidates? The difference is significant. The relationship between area of origin and success appears to be negligible for black cadets. However, for others, the relationship appears to be significant. Non-black officer candidates from the Northeast seem to have a higher success rate than non-blacks from other areas of the country.

Research Hypothesis Results

The following is a summary of the major findings in this study with respect to the research hypothesis:

1. H_0 : *The predictive effect of academic variables is not significantly different for black and other officer candidates. The results obtained in this study were not strong enough to reject this hypothesis. However, there does appear to be some difference in the predictive effect for black and other officer candidates.*

2. H_0 : *The predictive effect of area of origin is not significantly different for black and other officer candidates. There appears to be a difference in the predictive capability of area of origin for black and other officer candidates.*

Conclusions

The following points summarize the major findings of this study:

1. Using traditional measures of academic achievement alone will not ensure equitable attrition rates for black officer candidates. These factors do not contribute enough to prediction to use them for determining a potential candidate's success or failure.

2. There appear to be non academic factors that are important in predicting success in the officer commissioning process. Measures of academic achievement alone are not adequate to accurately predict success in the officer commissioning process. Measures of past academic success are more indicative of future academic success. However, academic study is only one aspect of the officer training environment. Other aspects include athletic and military training.

3. There appear to be unique, non-academic factors that are important in predicting success for black officer candidates. Although the predictor variables did a poor job of predicting success for both groups of cadets, they were less accurate for black cadets than for others.

4. Black officer candidates are less likely to voluntarily leave the commissioning process than other officer candidates. One reason for this might be that black candidates do not think they have as many alternative options as other candidates.

5. Black officer candidates are unsuccessful due to academic reasons more frequently than other officer candidates. Given conclusion 3 above, it would seem that there are unique, non-quantitative factors that effect academic success for blacks. Given conclusion 4, it would appear that one reason blacks are unsuccessful due to academic reasons more frequently than others is because they are not as likely to voluntarily leave the process. As a result, they will be forced to leave due to academic deficiency before they quit.

Discussion

Although academic predictors alone have very limited capability of predicting success once the officer training process begins, they do help to recruit candidates with the academic potential to succeed. Although this fact is more important to recruiting officials, it is related to attrition. As evidenced by the extremely low "miss" rate during our cross classification process, it is unlikely that a potentially successful cadet would be denied entry into an officer training program on the basis of academic background. Thus, these predictors help control attrition from the stand point that minimum academic standards keep those with weaker backgrounds out. Otherwise, attrition rates would be higher.

While academic variables are good for determining academic potential prior to the start of officer training, the role of academic potential becomes diminished in determining success once training begins. This conclusion is evidenced by the poor prediction of these variables and their low correlation to success. It seems that once training begins, the importance of academic potential diminishes as other variables become more important.

The relevance of non-academic variables seems to be valid in light of the higher attrition rates for blacks in AFROTC. At the Air Force Academy, the difference between black and other candidate attrition rates is relatively small. One reason for this minute difference may be the controlled environment of USAFA. Here, everyone is forced to participate in group activities that help to create a common bond among the cadets. As a result, all cadets are more likely to feel involved and their motivations are more likely to be congruent to the organization's. This level of involvement has been shown to be important to black student success (McClung, Waddle, and Harris, 1988:54-56).

Unlike USAFA, AFROTC training is conducted in an uncontrolled environment that is subject to many influences beside academics and military training. Participation in group activities is limited and group cohesion is more difficult to develop. As a result, the individual receives less motivation and support from the organization. This

situation may be more detrimental to the black cadet because he or she tends to be more isolated than other cadets. For example, a black cadet at a predominately white institution may have come from a background that was predominately black. As a result of coming from this background, the black cadet will now be in an unfamiliar situation. Without feeling a strong bond to the organization, black cadets may tend to be more subject to negative influences and leave the AFROTC program.

Unique, non-academic variables affecting black officer candidates may eventually manifest themselves in poor academic performance. As stated in the conclusions above, black candidates are less likely to voluntarily leave the commissioning process. Thus, they may initially be exposed to negative environmental influences but chose to stay in the commissioning program. These external influences will continue to hinder motivation and this lack of motivation may eventually manifest itself in terms of poor academic performance.

Applicability of Results

The authors feel that the results obtained in this study are highly representative of the actual success process of both USAFA and AFROTC. This representation is especially true for the USAFA cadets since our sample contained all of the candidates who entered between the

years 1983 through 1992. However, there may be limitations when interpreting these results for the AFROTC success process. Unlike the USAFA sample, the AFROTC sample had only a portion of the cadets who entered during the same time period. Nevertheless, the authors are highly confident in the AFROTC results because a large sample size was used.

Recommendations for Further Research

The conclusions and discussion stated above indicate that this area of research is not complete. Factors that are important to the success of black officer candidates in the USAF need to be identified. Since this study has shown academic factors to be limited in their predictive capability, the researchers recommend a survey instrument be used to examine non-quantitative factors. In this time of decreasing defense budgets, it is crucial for the Air Force to ensure that its black officer candidates are successful. The key to this success is to identify those non-academic factors that are relevant in determining the success of black officer candidates. To this end, the following topics of follow-on research are recommended:

1. *The effect of organizational involvement on success for black officer candidates.* In the Clemson University study discussed in Chapter II, the researchers found that involvement in school organizations and holding positions of leadership were almost as important as academic variables in

predicting black student success (McClung, Waddle, and Harris, 1983:54-56). Perhaps increased involvement in organizations will increase success for black officer candidates as well. Organizational involvement is crucial for preventing blacks from being isolated. It also serves as a conduit for networking and information--a crucial element for success in any organization.

2. *The impact of socio-economic environment on motivation for black officer candidates.* Hubert Blalock, Jr. concluded that there are unique factors that effect motivation for black students (Blalock, 1982:1). It is important for the Air Force to understand what factors effect the motivation of black officer candidates. With this knowledge, the Air Force will be able to effectively utilize the skills and talents of its black officer candidates.

3. *The impact of racism on black officer candidate attrition.* As discussed in Chapter II, recent events at USAFA suggest a heightening of racial tensions is evident in the officer commissioning process (Miller, 1993:1). Furthermore, as a result of apparent insensitivity to this issue, black cadets are losing confidence in the Academy institution (Miller, 1993:1). It is important for the Air Force to understand the nature and severity of this problem so that similar incidents can be avoided in the future.

4. *The availability of officer role models in the black community.* As discussed in the literature review, the number of black Air Force officers was severely limited until the early 1970s. As a result, there are not many successful officers in the black community. Without exposure to such role models, many blacks may be unaware of the opportunities that are available to officers in the military. Furthermore, they may lack the degree of motivation present in others who are aware of the opportunities. Understanding this issue can help the Air Force to develop an appropriate recruiting strategy that will ensure that blacks are aware of the opportunities available in the Air Force.

With decreasing defense budgets, it is important for the Air Force to make the officer commissioning process more efficient. Since blacks have higher attrition rates than members of other minority groups, it is in the best interest of the Air Force to analyze the problem, determine solutions, and implement them. The researchers have started the process by analyzing traditional, quantitative measures of academic achievement. Our analysis has indicated that these predictors explain only a small part of the overall problem. There still are a myriad of qualitative factors that need to be examined. We challenge other researchers to "carry the torch" and continue analysis on the subject of black officer candidate attrition in the USAF.

Appendix A. USAFA Officer Candidate Attrition Codes

Code	Reason for Departure
10	Academic and Military Deficiency
11	Military Deficiency
12	Court Martial
13	Voluntary Discharge
1A	Medical
1B	Conduct
1C	Academic
1D	Aptitude
1E	Aptitude and Conduct
1F	Aptitude and Academic
1G	Conduct and Academic
1K	Honor
1M	Honor
1O	Honor
1P	Honor
1R	Honor
1X	Honor
1Z	Aptitude, Conduct, and Academic
2A	Insufficient Choice of Courses
2B	Dislike Instructional Methods
2C	Pressure of Academic System
2D	Reserved
2G	Unwilling/Unable to Adjust
2H	Too much Regimentation/Lack of Freedom
2I	Too much competition
2J	Disappointed in level of Cadets/Peers
2Q	Insufficient Desire to Complete Program
2R	Always Desired Another Career
2S	Changed Career Interest
2T	Change in Physical Condition
3A	Honor
3B	Honor
3C	Honor
3D	Honor
3E	Honor
3F	Honor
3G	Honor
3I	Honor
3L	Honor
3P	Used Honor Code to Obtain Dismissal
3Q	Honor to Active Duty

Appendix A. (Cont'd)

Code	Reason for Departure
4A	Personal Reasons
4B	Marriage
4C	Impending Marriage
4D	Lack of Confidence
4E	Hardship
4F	Good of the Service
4G	Inability to Cope with Military Training
4H	Unable/Unwilling to Accept Honor Code
4P	Other
4Q	Impending Board Action/Lack of Aptitude
4R	Conscientious Objector
4S	Anti-Military Feelings
4T	Parental Pressure
4U	Impending Board Action\Conduct
4V	Impending Honor Board Hearing
5B	Involuntary Other Separation
6K	Adjustment\Departed on stop out

Appendix B. ROTC Officer Candidate Attrition Codes

Code	Reason for Dismissal
BC	Released due to contract changes
BD	Medical (contract)
BE	Academically disqualified (contract)
BF	Humanitarian Release
BG	Failure to maintain military retention standards
BH	Indifference to training
BI	Breach of contract
BJ	Transferred to other commissioning program
BK	Disenrolled without discredit
BV	Voluntary release program
CA	Failed to report to field training
CB	Denied Waiver
CC	Denied entry into POC
CD	Medical (non-contract)
CE	Failed to complete field training
CH	Denied category of first choice
CL	Financial Hardship
CM	Personal Problems
CN	Undesirable traits/Character
CU	Pilot slot unavailable
CV	Scholarship not tendered
CX	Dropped ROTC for CSEP
CY	Academics (non-contract)
CZ	Declined WPSS category of selection

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13. ABSTRACT (Maximum 200 words) This study investigated the correlation between measures of academic achievement and success in the Air Force commissioning process. The correlation between area of high school attendance and success was also examined. Any significant differences in the correlations for black officer candidates and other officer candidates were determined. An extensive literature review revealed that no similar Air Force study had ever been conducted. Discriminant function analysis was performed on a sample of approximately 14,600 U.S. Air Force Academy (USAFA) cadets and 6,500 Air Force Reserve Officer Training Corps (AFROTC) cadets. The researchers found that measures of past academic success were only slightly correlated with success. The researchers also found that although area of high school attendance was slightly correlated with success for other USAFA candidates, there was no correlation for black candidates. The researchers concluded that using these factors alone to predict success would be inadequate. There are other non-quantitative factors that are crucial to predicting commissioning success. Furthermore, there are unique non-quantitative factors that are crucial to predicting success for black cadets. The authors stress the need to continue this research. Potential areas of future research are suggested.				
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